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THE DIPTEROUS FAMILY CYRTIDAE IN NORTH AMERICA

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Introduction

This paper is the result of about two years interrupted study of the dipterous family *Cyrtidae*. It is an interesting little group of insects with a remarkable range of variation in structure. The collecting of more material will no doubt cause some changes to be made in the status of a few species, and further study will reveal other characters for the separation of the different forms.

The species of Cyrtidae are very rare, at least until their local haunts are known. In several places along the Pacific Coast large series of *Eulonchus* have been collected, but these are rarely found in any great numbers. The family is a small one and some species are known from only one or two specimens. Few collectors have any large number of these flies, and even those who have made a search for them have found them only at rare intervals. The species are not economically important, those in which the early stages are known being parasitic in the egg cases or in the bodies of spiders. In only a few species have the early stages been found and we know nothing of the life histories of some genera.

Several entomologists have at one time or another made a

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special study of the group and, as some of the articles are not easily accessible, notes from these have been incorporated in this paper.

Life history and habit notes are included in this synopsis, as they are of general interest and a great aid to the knowledge of the species; the larval and pupal characters may, when known, serve to separate some of the closely allied species and establish the relationships of the genera.

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Parasitism, among other agencies, has produced some curious modifications of the family type in the Cyrtidae and we see marks of degeneration. Wiedemann gave them the name of "fat-flies," because of their generally inflated balloon-like bodies. The common name of "small-headed flies" was given them by Comstock in his Manual; they might well be called "Swollen-bodied flies."

The drawings have been made from specimens, using a binocular microscope, and care has been taken to make them as accurate as possible, so that they would supplement the descriptions and aid in establishing some of the uncertain species. There is often quite a variation in marking and color, but most of the species have a "habitus." Important characters may be found in the genitalia when more work is done and dissections made.

History of the Family

Meigen in his "Klassification" first designated this group of Diptera. There has been much difference of opinion as to the correct name of the family, but it appears to me that the term Cyrtidae has the best claims for its adoption; *Cyrtus* is the oldest genus, having been described by Latreille in 1796. The name *Acroceridae* Leach (in Somouelles Compendium) is a very widely used term. Newman in 1841 used the term *Cyrtites*. Walker, in his "Revision of the Acroceridae,"[2] gives a list of fourteen names which have been used for this family: *Acroceridae* Leach; *Acrocerides* Leach; *Bombyliarii*, p. Lam.; *Aplocera*, p. Dumeril; *Inflatae* Latr.; *Inflata* Meig.; *Stratiomyidae*, p. Rafinesq.; *Cyrtites* Newman; *Ogcodina* Rond.; *Inflata* (Henopii) Agassiz; *Acrocerinae* Zett., and *Cyrtidii* Bigot., instead Kertesz in his "Katalog" (1909) used *Oncodidae*. The term Cyrtidae means hump-backed, a good general characterization of the family. *Acroceridae* (from *akros*-summit and *keras*-horn) is derived from the character of the insertion of the antennae on the vertex, which is not a universal character by any means. *Henopidae* comes from a word meaning "one-eyed," and was used by Erichson in his "Monograph" of the family in 1840, after the name had been given up by others.

The family is remarkable for the singularly swollen body, especially the abdomen, and Latreille gave it the name of *Vesiculosa* for that reason. Meigen in 1822 (102), called the species of *Henops* "Mundhornfliege." Wiedemann in his "Aussereuropaische Zweiflügelege Insecten," in 1830, gave them the name "Feistfliegen," literally fat flies. Latreille maintained that the name *Henops* should be changed to *Ogcodes* (better *Oncodes*). Meigen, in 1822 (102), gave the first synopsis of the family under the name *Inflatae*. He gave a generic description of *Cyrtus*, but stated that he could not give a general survey of the family because he was familiar with only one species—*gibbus*. He gave the main characters of *Acrocera*, enumerating five species, and mentioning that all were rare and that he had never collected any. The next important paper on the *Cyrtidae* was by Wiedemann in 1830 (156), who used the name *Inflatae*. There were four species of *Cyrtus* enumerated, two species of *Acrocera* (including *A. fasciata* from Georgia), one species of *Philopota* from Brazil

[2] List–Supplement, part II, p. 331, 1854.

and the genus *Panops*. Wiedemann made two divisions: those with, and those without ocelli.

Erichson's "Monograph of the Henopidae" was published in the "Entomographien" in 1840. A very good synopsis of the family is given in this paper. Erichson made three subdivisions: the first division with a long thin *Bombylius*-like proboscis, carried pointed back under the body when at rest and not porrect; in the second division, those species having only a stump of a proboscis were included. The third division contained only those having absolutely no mouth-parts, a membrane closing the mouth opening. The genus *Oycodes* was the only member of this last group.

Erichson noted the importance of the antennae in classification, their structure and the position occupied on the head. He stated that the eyes are most broadly separated in *Pialea*, which has two ocelli; *Astomella* has none. The structure of the antennae and their position on the head formed the basis of the separation of the different forms, thirteen genera being included in the table: *Panops, Lasia, Cyrtus, Psilodera, Thyllis, Philopota, Ocnaea, Astomella, Pialea, Pterodontia, Acrocera, Terphis* and *Oycodes*. In these genera forty-seven species were known at that time. Dr. Erichson, in discussing the systematic relation of the family, stated that he thought the Cyrtidae (Henopidae as he called them) might be limited on the one side by the Syrphidae, and on the other by *Conops, Myopa* and perhaps *Oestrus*.

In 1851, Walker gave some notes on the family in "British Diptera," adopting the name *Acroceridae*. Only two genera were known from England, *Acrocera* and *Henops*, and both were briefly described. In 1854, Walker published a short revision of the family, with a table of eighteen genera, *Pteropexus, Exetaxis, Eriosoma, Physegaster* and *Sphaerogaster* having been added since Erichson's "Monograph." Walker gave only a short Latin description of the species and a description of the wing venation of each genus in English.

In 1856, Gerstaecker made a valuable contribution to the knowledge of the family in his paper, "Beitrag zur Kenntnis der Henopier" (42). In 1862, Schiner gave a short synopsis of the family

in his "Fauna Austriaca," which contained an outline description of the genera known from Austria. In this article he stated that the metamorphoses of these flies were unknown. In 1868, Schiner made several observations on the Cyrtidae in the "Reise der Novara," making the following synonomy: *Henops* Fabricius referred to *Ogcodes* Latreille; *Eriosoma* Macquart and *Exetaxis* Walker to *Ocnaea* Erichson; *Pithogaster* Loew to *Opsebius* Costa; *Platygaster* Zetterstedt to *Sphaerogaster* Zetterstedt; *Mesocera* Macquart to *Psilodera* Gray; *Mesophysa* Macquart to *Panops* Lamarck and *Megalybus* Philippi to *Thyllis* Erichson. Loew in "Fauna Sudafrikas," in 1860, proposed a division of the Cyrtidae into two sections—*Oncodina* and *Cyrtina*, and he held to this in his Monographs. The subdivisions were based merely on wing venation and of course proved a failure. Schiner's proposed system was much more satisfactory and he adopted the natural group Philopotina. He took as the basis of his classification the structure of the thorax. In the Philopotinae the prothoracic lobes are greatly developed and meet above. The other forms are divided into two groups: the Acrocerinae with the short third antennal joint and a terminal arista, and the Panopinae, in which the third antennal joint is long or very long and never furnished with an apical arista. Schiner recorded one hundred and three described species of Cyrtidae, distributed as follows: Europe 22, Asia 4, Africa 13, America 57, Australia 6, and one unknown. *Sphaerogaster* was the only genus peculiar to Europe, nine genera being exclusively American and one (*Psilodera*) peculiar to Africa.

Very little has been written on this family in America, the species being so rare. In 1902, Professor Melander published a short paper on some of the species. Osten Sacken had always been very much interested in the family and had started a monograph in 1895. When he heard that Wandolleck was working on one at this time, he turned over the work to this dipterist, but it seems that circumstances prevented the finishing of the monograph. Mr. C. W. Johnson's paper on the genus *Acrocera* has many valuable notes on several of the species. In twenty years of collecting Mr. Johnson has been able to get seventeen species of Cyrtidae, and this is, I believe, the best collection in the country.

Structural Characters

Osten Sacken noted the fact that a considerable number of the archaic forms occurred in the Eremochaeta, "survivals of bygone zoological horizons" as he aptly terms them. The genera near the Nemestrinidae in venation and with a long proboscis are the oldest, one species of this type having been recently described by Meunier from Baltic amber. In the Cyrtidae we have a family which has been modified by parasitism; undoubtedly those genera having a long proboscis and a complex wing venation are the oldest forms and the others have become curiously degraded by their mode of life.

These very interesting flies vary in size; the smallest one known to me being 2.5 millimeters long and the largest about 17 mm. They belong to the Orthorrhapha brachycera and are devoid of bristles. The head is small and composed almost entirely of the huge rounded eyes. Both sexes are holoptic or nearly so, and the face is small and situated almost on the under side of the head. There are usually three ocelli, but some forms have two and the European *Astomella* none; *Lasia ocelliger* is said to have one ocellus. The proboscis in one group is so small as to be hardly visible (with the mouth opening closed by a membrane in one genus), and in the others is long and slender. The eyes may be hairy or bare, with all the facets equal. The antennae are three jointed, although there are at times apparently only two joints, the first being sunken in the head. The antennae are usually short, close together at the base (in *Pialea* grown together), and in varying positions on the head; they may be just below the ocelli on the vertex, in the middle of the head or far down on the rim of the mouth. In one group the third joint is short and with a long, thin apical arista; in another group elongate and strap-shaped, and in *Pterodontia* with three apical setae.

The thorax is humped and rounded and much wider than the head. In the Philopotinae the prothoracic lobes are abnormally enlarged and meet above to form a shield on the prothorax. The pubescence is very thick in some species, but there are never any bristles. The scutellum is large, usually concealing the metanotum.

The abdomen is usually globose or balloon-shaped, appearing swollen, and there are usually five segments. The abdomen in *Eulonchus* is longer and not so distended, and in some foreign genera, such as *Thyllis*, the shape is quite different. The pubescence may be thick or sparse. The female genitalia are most conspicuous in *Acrocera*, and the male genitalia are easily made out in *Ogcodes*. Male specimens of *Eulonchus tristis* and *E. sapphirinus* taken by the writer during the breeding season had the male genitalia protruding, and in some specimens quite prominent.

The legs are of medium length and strength and there are no spines or bristles, although there are often tibial spurs; these are really sharp projections of the tips of the tibiae, however, and are quite short. The empodia are developed pulvilliform and pad-like; the claws and pulvilli are well developed and there appears to be no sticky secretion on the pads, which enables most flies to cling to a smooth surface.

When at rest the wings are deflexed and lie against the abdomen roof-like. The wings are longer and usually broader in the female than in the male. The venation is often puzzling and difficult of interpretation, and to add to the difficulty the veins are often weak. The costal vein may not reach the wing-tip or it may continue all the way around the margin. The praefurca starts about opposite the discal cell, and the discal cross-vein (absent in some) is placed close to the praefurca and near the base of the discal cell. Another cross-vein often occurs near the end of the discal cell, causing a supernumerary cell. Osten Sacken considered this outer division a posterior cell and not an outer part of the first basal cell, which Verrall thought it to be; I am inclined to adopt Verrall's viewpoint. These veins may be obsolete in some and the number of posterior cells reduced. The second longitudinal vein may be absent. The branch of the third longitudinal may be long and normal, including the wing-tip, or both branches may curve up and run parallel to the margin before the wing-tip. In *Acrocera* there is a wide open, spurious, third longitudinal fork, and the lower branch, is, I believe, a part of the fourth vein. There is a spurious cross-vein which is really the upper branch of the fifth longitudinal fork. The wing membrane is usually bare and in most species rippled.

The alulae vary in size; the thoracal squamae are always large and are one of the striking characters of the family, the margins being thickened and with a fringe, in some forms with a hairy surface. The alar squamae are not abnormally developed, with a short fringe or bare. The halteres are small and entirely covered by the bulging squamae.

The venation is very important, although the classification cannot be based on this alone, as has been proven. *Lasia*, which is represented in the United States by two species, has a venation very near the Nemestrinidae (see Plate I, fig. I). In *Hirmoneura* (Nemestrinidae) the discal cell is absent but otherwise the venation corresponds to *Lasia*. Verrall says: "It would appear that an absolutely different principle has been adopted (in two allied groups) to strengthen the wings; in the Nemestrinidae by tying the elongate end veins together, but in the Cyrtidae by connecting the anterior and posterior parts of the wing by a strong tie near the base and also (in *Lasia*, etc.) by a second tie near the end of the wing." When the Cyrtidae adopted the floating flight which some of them have, the second tie was allowed to die out and the outer veins to become obsolete. The venation of *Eulonchus* is very near *Lasia*, but the third longitudinal fork is less like the Nemestrinidae and the axillary vein is not so strong.

Thyllis gives a clue to the venation of *Oncodes* and *Acrocera*. The fork of the third longitudinal vein has disappeared and, in one species of that genus (*T. crassus*), the third veinlet from the discal cell has been obliterated, thus there is no closed fourth posterior cell. In *T. tristis* the third vein seems to exist and is a continuation of the fifth longitudinal vein which has disappeared. The venation of *Pteropexus* is near that of *Eulonchus*. *Opsebius* (Plate I, fig. 8) and *Cyrtus* have a venation very near alike; the third longitudinal fork is still present in these two genera. There is quite a variation in the former; in some the anal cell is closed and petiolate and in others wide open. Perhaps the venation of *Opsebius* is a modification of that of *Cyrtus*. Loew in figuring the wing of *Opsebius inflatus* left out the characteristic cross-vein which forms the outer first basal cell; Osten Sacken discovered this in examining the type. The venation of *Ocnaea* (Plate I, fig. 3) is very near that of the South American *Holops* and varies

considerably. The fork of the third longitudinal vein is present, but in one species from North America (*O. locuri*) the lower branch does not reach the wing margin. In *O. schwarzi* new species, from Cuba, this is not the case, but the vein from the outer first basal is only a stump.

The genus *Astomella*, which does not occur in North America, is intermediate between *Thyllis* and *Pterodontia;* the unforked third longitudinal vein can be traced; the closed fourth posterior cell remains (actually the third), and a fifth longitudinal fork, but the second veinlet from the discal has disappeared and the number of posterior cells has been reduced. It becomes clear that the wide open space at the wing tip is the first posterior and not a submarginal cell.

Pterodontia (Plate I, figs. 6 and 7) shows a great change in the development of the third (discal) vein. The second longitudinal vein curves up into an enlargement of the costa. *P. analis* shows the continued presence of two discal cross-veins, and also shows that the so-called outer first basal cell has merged with the discal cell, thus the upper branch of the fourth vein has disappeared, but the upper veinlet of the discal cell remains, the lower branch of the fourth longitudinal bends sharply downwards and meets the upper branch of the fifth vein, going to the wing margin. In *P. analis* there are three posterior cells and in *P. flavipes* two.

In *Ogcodes* (Plate I, fig. 2) the discal cross-vein is still apparent, but is very faint. The first basal cell is much longer, and thus the discal cell is much farther from the base of the wing, and, consequently, as the supernumerary discal cross-vein is not required it has disappeared. The shape of the anal cell indicates a degraded form of *Astomella* as Verrall noticed. The outer cross-vein has disappeared, so the lower one of the three vagus veins between the third vein and the lower branch of the fifth longitudinal would be a branch of the fourth longitudinal.

Philopota (Plate I, fig. 5), one species of which (*truquii* Bellardi) was described from Mexico, shows the auxiliary, first and second veins clearly, but the next (incomplete) vein may be the upper branch of the third vein, and if so the discal cross-vein is absent. The apparent cross-vein will be (as in *Acrocera*) the beginning of the upper branch of the fourth longitudinal, and there are two rather undefined basal cells.

In *Acrocera* (Plate I, figs. 4 and 9) there is a great reduction and transposing of veins. The origin of the first, fourth and fifth longitudinal veins can be clearly traced, but their subsequent development is confused because of the suppressions of long veins and cross-veins. The praefurca arises from the first longitudinal vein and the second longitudinal is present in some and lacking in others. The majority of Cyrtidae have the second vein complete, in some it is missing and in some represented by a stump, either at the distal or the proximal end. Thus at times there is one, and in other cases no submarginal cell. *Acrocera bimaculata* is the best example of stunting, the stump being in the wing margin. This proves that the total disappearance is not a consequence of coalescence with the first vein, but of obliteration. Osten Sacken thus correctly infers that the obliteration of the second vein in *Acrocera* is not a deep-seated character at all, and not an index of a corresponding change in the rest of the organism. Dr. Griffini expressed this opinion when he cast the genus *Paracrocera* into synonomy. Mik united the species of *Acrocera* which lacked the second vein into a new genus which he called *Paracrocera*. There is no discal cross-vein, the almost upright vein just after the middle of the wing is a portion of the fourth longitudinal vein (as in *Pterodontia*). The almost upright vein connecting the fourth and fifth longitudinal veins is the upper branch of the fifth vein.

A few Bombyliidae (such as the genus *Glabella*) have at times been mistakenly placed in the Cyrtidae. There are analogous insects as far as shape goes in Coleoptera, Homoptera and Orthoptera, and affinities can be seen with the hump-backed Bombyliidae in some instances. Like the parasitic Oestridae and Tachinidae these flies have very large thoracal squamae. Aldrich placed the Cyrtidae between the Nemestrinidae and the Bombyliidae in his "Catalogue," and I believe this is their proper position in the system.

Habits of the Cyrtidae

The adults of *Lasia* and *Eulonchus* are known to suck the nectar of flowers, but most of the genera, having undeveloped mouthparts, can take no nourishment. Philippi mentions the finding of adults of *Megalybus* on flowers—"the larvae live, it seems, in wood, at least my son Karl in Dec. 1863 found a fly of this species

just crawling out of a tree." Two specimens of *Holops cyaneus* were found in the summer of 1859 on the window of his house in San Juan. They flew heavily and allowed themselves to be caught easily. Philippi says of *Panops nigritarsis:* "This magnificent fly is not rare in the province of Valdivia; they fly uncommonly fast, as do the others of their genus, and buzz as strong as a bumble bee; by preference they sink their long proboscis in the flowers of *Alstromoeria aurantiaca,* and they are then easy to seize, when they are busy with sucking." He speaks of finding *Panops aeneus* almost every year near Santiago at the foot of Cerro San Cristoval, in the month of November, and feeding on the flowers of *Silybum marianum.*

Most of the species of the family are considered rare, but Osten Sacken states that they are numerous in parts of Australia. Schiner speaks of finding *Acrocera globulus* in swarms at Trieste in 1862, when they alighted on the visor of his cap and swarmed like Anthomyiids. In 1851, Walker in speaking of the habits says: "The *Acrocerae* are very sluggish, and are often seated in groups on the withered trunks and branches of oaks and other trees, about which they fly when the sun shines in warm weather, they also frequent thickets and herbage beneath trees."

The observations of Gerstaecker on some European species are interesting. He and Stein found great numbers of Cyrtidae in the Brieslanger forest, the adults being collected in a meadow with scattered willows and blackthorn bushes, most of them on the dry leafless branches of *Equisetum limosum.* As many as fifteen or twenty were observed on a single blackthorn bush in the hot sun, and they could usually be picked up in the fingers, only flying a short distance in any case. A trip was made later in the season and only a few living females were found in the spider's webs; Gerstaecker not knowing their habits did not think of their being parasitic on the spiders. A few dead ones, *apparently in good shape,* were found. This is an interesting observation, and the writer has found *Opsebius diligens* in a spider's web untouched, with two large spiders in the web. Gerstaecker remarked that the males of *Ogcodes zonatus* flew oftener and were more lively than the females. Great numbers of the males played about on the plum bushes, the females never joining in the play.

A pair was observed in copulation, the male bracing itself with its hind legs on the costal border of the long wings of the female.

Westwood, Van Heyden and M. V. Auduoin all observed that a certain species of *Crabro* invariably selected *Ogcodes gibbosus* to store its burrows in the brambles. Rev. H. S. Gorham observed this same thing; he noticed a thistle (*Cnicus palustris*) with a hole in it about three feet from the ground, around which several spiders seemed watching. On investigating he found the hollow stem which led to the hole filled for about eight inches with the rare fly *Ogcodes gibbosus*. There were twenty-five or thirty flies, then a wad of frass or débris, and then another segment and a wad. In some a hymenopterous larva was engaged in devouring the stored-up flies. The spiders remarkably resembled the Cyrtids and Dr. Sharp pointed out that they were undoubtedly hosts of the flies; the mimicry never having been noticed before. In all more than fifty flies were found in the burrows, dead but quite fresh. Another Cyrtid, *Helle longirostris* Hudson, from Australia, is "an extraordinary and very rare species, occurring among white rata (*Metrosideros scandens*) blossoms in February."

The Cyrtidae are very clumsy and sluggish when walking, some of them falling over easily. *Pterodontia* is described as having a balloon-like flight. *Opsebius diligens* has a floating sort of flight, rather undulating and uncertain. It has the habit of buzzing around in circles when it falls over on its back on a smooth surface, often doing this for some time before it can regain its feet; most of the time it is making a high, thin humming sound. When walking the long wings drag on the ground. I collected a number of specimens in Southern California on warm sunny days, flying around vines which contained spider's webs. They seemed to have no fear of anything and could be easily approached. They differ in this respect from *Eulonchus tristis* and *E. sapphirinus*, both of which are quite wary, especially in the heat of the day. The species of *Eulonchus* are very quick of wing and are not sluggish when captured, although they are a little clumsy. When caught in the net they hum like a Syrphid, but make no noise when flying. Several specimens were taken near Parkdale, Oregon, and were kept alive for a short time, but none lived longer than forty hours and the females did not lay

eggs. A specimen of *E. tristis* was found in the clutches of a yellow crab spider, which had been lying in ambush on one of the flowers frequently visited by this fly. This is of interest in view of the behavior of spiders when confronted with specimens of *Opsebius diligens*. If this spider was a host of the fly it was not aware of the fact. It is possible that other spiders might not act the same, and it is also possible that the flies of this genus are not parasitic on spiders.

In England, Standish speaks of having beaten a species of *Ogcodes* from old white-thorn bushes. They were sluggish in the net and laid with their wings closed. The slightest pressure destroyed the rotundity of their bodies. Mr. J. L. King, in Ohio, observed *Pterodontia flavipes* hovering around the trunks of trees and ovipositing; they were very sluggish and easily captured.

Early Stages and Life History

Gerstaecker first observed one of the larvae of the Cyrtidae in 1856 and reported it. Stein, according to Gerstaecker, had found them several years before, and had discovered *Ogcodes fuliginosa* ovipositing on *Equisetum limosum*. There were spots and round holes on the branches of this plant which Gerstaecker believed to be the dwelling places of the larvae. On the pin with a specimen of *Ogcodes zonatus* he found a great mass of black eggs, long egg-shaped, somewhat flattened and about one-sixth of a millimeter long. The plants in a certain meadow were covered with these eggs.

Menge (105) was the first to record the Cyrtidae as parasitic in the bodies of spiders. *Ogcodes pallipes* (*Henops marginatus*) Erichson, was bred from *Clubonia putris* Koch, the spider being found with a large hole on the under side of the abdomen. Brauer, in 1869 (18), published a paper, "Beitrag zur Biologie der Acroceriden," in which he described and figured the larva and pupa of *Astomella lindenii*, found in the burrow of a spider (*Ctenziana ariana*). Brauer stated that Gerstaecker had found a pupa of *Ogcodes fumatus* Erichson in a web near a dead spider. Brauer gives good figures and descriptions of the early stages of *Astomella lindenii*, which came from one of a number of nests of the spider *Ctenzia ariana* Koch collected in Corfu. In 1883, Brauer made further discoveries, finding that the larvae, while lodged

in the abdomen of the host breathe by placing their caudal spiracles in one of the lung chambers of the spider. The larvae were about ten millimeters long and rather thick, the body composed of twelve segments; the head small and fitted with maxillae. They were amphineustic, having prothoracic and caudal spiracles.

Mr. J. H. Emerton (33) was the first to record the finding of a Cyrtid larva in America. Mr. C. W. Johnson, in 1903, reported rearing *Acrocera fasciata* from *Lycosa stonei* Montgomery, twenty-five per cent of the spiders being parasitized. Montgomery, in his paper on the habits of spiders, in 1903, reported rearing the same species from *Lycosa stonei*. One spider contained two and the others one each of the larvae. The parasite was very large and ate most of the soft parts of the spider, emerging from a hole in the abdominal wall, thus killing the host. "A short time before the parasite escapes the spider acts in a peculiar manner walking about spasmodically and often spinning aimlessly."

Verrall said that the larvae of the Cyrtidae were parasitic on such spiders as the Aviculariidae, Theridae and Drassidae. Wandolleck described a new species of *Ogcodes* which he received from North Queensland, Australia, collected by Mr. Dodd, who supplied the following notes: "In crevices of the leaf nests of the green ant (*Oecophylla virescens* Fabr.) a pretty jumping spider lives and breeds. The nests are generally abandoned. A bulky female of the spider was left in a box so it could be observed, and was soon found dead with the abdomen small and shrunken and a peculiar dark object in the web. Later in the day it became lighter in color and was made out to be a short thick pupa, which emerged in about twelve days. The spider was *Cosmophasia bitaeniata* Keyserling, and the fly determined as *Oncodes* [*Ogcodes*] *doddi*. Two more spiders bred out this *Oncodes*."

In 1894, König published an article on the eggs and first stage larvae of an *Ogcodes*. The material was collected by Brauer in a meadow in Gmunden, Upper Austria, early in August. Both *Ogcodes gibbosus* and *O. zonatus* were collected nearby, so the identity of the larvae is not certain. The young *Ogcodes* larvae were found by Brauer on dry bushes. "The smallest twigs were regularly covered with black dots in rows . . . the pear-shaped eggs colored deep blackish brown and fastened tight to the twigs by the small end, opening with a small lid. What appear

to be fine dark erect bristles between the eggs are larvae. Webs of orb weavers are often seen in the branches. The larvae are three to four millimetres long, dark brown and with numerous bristles. There is no head proper and eleven segments in all, each segment projecting over the next following a little. The larva normally holds fast by the clasping apparatus and stands out straight from the branch, pulling its body together if disturbed and moving forward with the support of the springing bristles, although it can crawl or move by stretching." Brauer found some of the larvae fastened on Podurids with the clasping apparatus. König gives a full description of the larva. The mouth-parts are spoken of as complicated and hard to work with, and they are singularly like those of Bombylid and Nemestrinid larvae, if one can trust in comparison the drawings by Brauer. This is very important in the establishment of the systematic position of the family.

Mr. J. L. King gives the most complete life history yet published, in his article on *Pterodontia flavipes* Gray (62). The pupa has no setae or spines except a V-shaped crest on the head, and the various adult parts are defined. The abdomen has eight segments, the anterior three each bearing a pair of elevated spiracles. The pupa of *Astomella lindenii*, as figured by Brauer, has a prominent head and no crest of spines. The abdomen shows seven segments, with spiracles on the anterior six, and the thorax bears a row of spines on the mesonotum. Malloch has described the pupa of *Ogcodes costatus* from a pupal exuvium which was in rather bad condition (97). There are no spines on any part and the thorax has a wart-like protuberance on each side of the disc anteriorly. The abdomen has wart-like protuberances on the spiracular areas of segments one to four.

Mr. J. L. King, in the above mentioned paper, recorded the oviposition of *Pterodontia flavipes*on the trunks of old hickory trees. One female laid 2,300 eggs in forty-five minutes, the largest total number being 3,977. The eggs were .18 mm. long and .15 mm. wide, pear-shaped, slightly compressed and black.

In the early summer of 1915 I was able to get some notes on *Opsebius diligens* O. S. while at Pasadena, California. On June 6, I placed a female in a glass jar and she at once commenced laying eggs, discharging them rapidly from the ovipositor, even when on

the wing. These eggs were black, papillose and pear-shaped, and did not hatch until forty-nine days later. This female laid eight hundred and nine eggs, another nine hundred and five. One lot of eggs laid April 12 hatched June 2. I placed some of the minute larvae on spiders (*Theridium tepidariorum* Koch) and they at once attached themselves to the legs and body of the host. The spiders scratched frantically at first and were seen to kill some of the larvae with their jaws. The larvae when attached would usually stand out straight from the body of the spider, resembling erect bristles. They were gray in color, twelve-segmented, including the head, and with whitish bands between the segments and black bristly hairs. When not attached they were very active. They were able to follow along a single thread of a spider web, usually proceeding like a looper. Only one mature larva was found in a spider web and this one died as it was pupating. The work on *Opsebius* was interrupted before any mature larvae could be reared and all of the material was lost.

I have found nothing in literature in regard to the behavior of spiders when confronted with one of these Cyrtid parasites and it is interesting to note their actions. I placed an adult female of *Opsebius diligens* in a battery jar, with a large female spider which had filled the bottom of the jar, with its web and was standing guard over its egg case. The fly paid no attention to the spider and kept on floundering through the web, scattering eggs as it went. The spider appeared quite disturbed and would run up to it and then turn and run back to the egg case. On one occasion the fly approached very near this treasure and I prepared to rescue it when the spider came rushing out, but no interruption was necessary. The spider tried to scare away the little intruder by nipping at it but soon lost courage and ran back in her tunnel. This is all the more remarkable in view of the fact that the spider had not been fed for two or three days. To test her I threw in a couple of house flies and saw them crushed and carried into her parlor without any hesitation; a large blue bottle fly met the same fate. There seems to be some recognition on the part of the spider that this small fly is something out of the ordinary. It may have an instinctive dread of its parasite and recognize it at once. The continual humming noise made by this fly was not the cause of this fear, for the body of a freshly killed specimen was

placed in a web with two spiders and was approached warily but not touched. It may be that all spiders would not show such consideration for this fly. It would be reasonable to suppose that it would arouse fear in only those spiders which were parasitized by it.

In the case of *Pterodontia flavipes* the period of incubation was recorded by King as thirty-two and thirty-three days, the larvae emerging from a lid-like opening at the pointed end of the egg. These first stage larvae are campodeiform, dark brown or black in color and about 0.25 mm. long, the body composed of twelve segments including the head. The caudal end of the eighth abdominal segment has a sucker or disk which serves for attachment. On each side of the caudal disk is a long stiff spring-bristle used in leaping. There are no spiracles. On the caudal margin of the eighth segment are two crescentic areas resembling spiracles; these are notches in which the caudal setae, or spring-bristles, rest when the larva stands erect. The larvae are quite active, particularly at night, and leap five or six millimeters. They crawl by extending and contracting the body segments.

Classification

Key to the Subfamilies

Prothorax abnormally enlarged and meeting above in front of the mesonotum. Wing venation more or less complete, but never complex, and the crossveins may be lacking. Proboscis short or moderately long, never entirely aborted. Abdomen never abnormally inflated, in some cases rather slender. Tropical species. . . . . **Philopotinae**

Prothorax normal, not unusually developed. Third antennal joint long, often laterally compressed; North American forms, except *Pialeoidea*, with no apical arista or hair-like rays. Venation complete, often complex. Proboscis short or long, in some species longer than the body. . . . . **Panopinae**

Prothorax not unusually developed. Wing venation often much reduced. Antennae small, inconspicuous, and with a terminal arista or hair-like rays. Abdomen usually swollen in appearance or balloon-shaped. . . . . **Cyrtinae**

Table of North American Genera

1. Prothoracic lobes greatly enlarged, meeting in front of the thorax. Proboscis elongate. . . . . **Philopota**
   Prothoracic lobes not forming a shield in front of the thorax. 2
2. Proboscis small, aborted. 3
   Proboscis elongate. 9

3. Antennae elongate, the third joint large 7
   Antennae short and inconspicuous 4
4. Antennae inserted below middle of head in profile 5
   Antennae inserted above middle of head in profile 6
5. Third joint of antennae with three terminal setae. Wing with costalmargin enlarged near the tip of the first vein, with a spur in the male. **Pterodontia**
   Third antennal joint with a slender terminal arista. No tooth on the costal margin ..... **Ogcodes**
6. Venation complete; usually quite thickly pilose species with pilose eyes. **Opsebius**
   Venation more or less modified, some of the veins obliterated or rudimentary. Thinly pilose species with bare eyes ..... **Acrocera**
7. Eyes bare ..... **Apelleia**
   Eyes pilose or pubescent 8
8. Third antennal joint large and without terminal bristles ..... **Ocnaea**
   Third antennal joint with terminal bristly hairs ..... **Pialeoidea**
9. Large flies with no palpi and usually two ocelli. Proboscis very long. **Lasia**
   Moderately large flies with distinct palpi and three ocelli on a more or less prominent tubercle ..... **Eulonchus**

The Australian genus *Nothra* probably does not occur in North America. Dr. Williston in his Manual states the following: "The occurrence of *Nothra americana* Bigot in North America is doubtful. If, however, Bigot correctly recognized it, the species should be sought for under *Oncodes* [*Ogcodes*]." I believe that Bigot had before him a female of *Pterodontia misella* O. S. when he wrote this description.

Philopotinae

The Philopotinae are not represented in America north of Mexico. There are three species described from Mexico, all in the genus *Philopota*. (This group is typically South American.)

PHILOPOTA

Wiedemann, Aussereurop. zweifl. Ins., ii, p. 17, (1830).
Erichson, Entomographien, p. 152, (1840).
Bigot, Ann. Soc. Ent. Fr., ser. 5, viii, Bull. p. lxxi, (1878), *Oligoneura*.

Antennae porrect and approximate, inserted far down on the head, just above the proboscis. The proboscis elongate and carried back beneath the body. Eyes contiguous and hairy. Ocelli three. The prothoracic lobes, as in others of the subfamily,

are extraordinarily developed, being contiguous in front of the thorax; thus differing from all other Diptera. The abdomen is conical in shape.

The venation is quite simple and is put between *Ogcodes* and *Acrocera* by Verrall, who described the venation of *Philopota truquii* Bellardi. He was not sure of some of the veins. The vein following the second longitudinal is incomplete and may be the upper branch of the third vein, and in that case there is no discal cell. The almost complete branch of the fourth vein can be made out, and the fifth longitudinal and anal veins. Verrall considers the cross-vein a beginning of the upper branch of the fourth vein. The two basal cells are not distinct.

Type.—*P. conica* Wiedemann from Brazil.

Synopsis of Species

1. Black species, with yellow markings and silvery-white pubescence.....2
   Dark brown species, bronze pilose.....**truquii** Bellardi
2. Strongly marked with yellow on thorax and abdomen.. **lugubris** Williston
   Species with few yellow markings, abdomen black except narrow yellow lateral margins.....**dolorosa** Williston

Philopota lugubris

Philopota lugubris Williston, Biologia, Dipt., p. 297.

"Deep black with yellow markings. Frontal triangle silvery-white pubescent. Antennae black. Labium short, black, the proboscis otherwise light yellow. Prothorax above yellow, its median line brown. Mesonotum and scutellum brassy black, finely punctulate, moderately shining; on either side of the mesonotum in front a yellow spot connecting with the yellow of the pronotum; post-alar callosities yellow. Mesopleura silvery pubescent. Abdomen black, silvery pubescent; first four segments with an interrupted yellow band on the posterior part, that on the second forming two large subcrescentric spots, the others narrower; on the fifth segment a narrow yellow hind border; all these segments with the posterior angle broadly yellow. Femora black; their tip, the tip of the tibiae, and the basal joints of the tarsi, yellow; tibiae and tarsi otherwise reddish or brownish. Wings tinged with yellowish. Length 6–7 mm.

"Hab. Mexico, Xucamanatlan and Amula in Guerrero at 6,000 to 7,000 feet (H. H. Smith).

"Four specimens. In one of them the yellow on the margin of the fourth and fifth abdominal segments is wanting. Although the markings are very similar to those of *P. truquii* and *P. conica*, the present species cannot be identified with the former on account of its black color, nor with the latter by reason of yet more pronounced differences."

Philopota dolorosa

Philopota dolorosa Williston, Biologia, Dipt., p. 298.

"Very much like *P. lugubris;* but the frontal triangler is larger, reaching midway to the ocelli; the abdomen is wholly without yellow, save the very narrow lateral margins of the segments; the mesothorax also lacks the large yellow spots, and there is only a small yellow spot on each side of the posterior margin of the pronotum. The legs are black, with the knees and basal joints of the tarsi reddish. Length 6–7 mm.

"Hab. Mexico, Amula in Guerrero (H. H. Smith).

"One specimen. I cannot believe that the strongly marked differences between this and the preceding species are merely varietal, though such is possibly the case. I am unable to determine the sex; it appears to be the same in our examples in both forms."

Philopota truquii

Philopota truquii Bellardi, Saggio, i, p. 77, pl. 2, f. 20.

(Transl.) "Dark brown, yellow, and ashy, everywhere dense bronze pilose. Head small and subspherical; the occiput fuscous; the frons is dense golden pilose; the antennae are black. The face is black, shining and bare. The proboscis is long and light yellow in color. Thorax very gibbous, the prothoracic lobes on the anterior margin and inner side spotted and marked. The sides of the thorax and scutellum are fuscous, bronze pilose, in zig-zag lines; prothoracic lobes contiguous; spots and vittae rufous rose. Abdomen ovate, incrassate; all of the segments with posterior margins and sides rufous rose-colored, bands slightly interrupted dorsally, dentate on the edges; venter colored and marked as the dorsum of the abdomen. The femora shining black, at the base and below irregularly marked reddish-brown and banded. The knees, tibiae and tarsi at base flavous, tibiae and tarsi pale. Wings long, anterior margin yellowish; the veins brown-black. Calypters broad, whitish and white pilose with yellow margins.

Length of body, 8 mm.; of wings, 19 mm."

Habitat.—Mexico, Cuazimalpa (Truquii).

Panopinae

There are several genera in this group in North America: *Pialeoidea, Apelleia, Ocnaea, Lasia* and *Eulonchus.*

PIALEOIDEA

Pialeoidea Westwood, Trans. Ent. Soc. London, p. 514, (1876).
Pialoidea, Aldrich in Catalogue, 1904.

"Head small, eyes very nearly contiguous, hairy; two ocelli on vertex. Proboscis short. Antennae longer than head, inserted on a tubercle before and near the ocelli, the bases contiguous, three-jointed; the two basal joints short, third joint long,

subcylindrical, the apex with setae. Scutellum transverse; abdomen ovate, thorax barely wider; wings short, the venation as in *Pialea;* middle longitudinal veins extending straight to posterior margin of wing, however. Near the genus *Pialea*, differs in the insertion of the antennae and also in the median longitudinal veins."

Pialeoidea magna

Pialeoidea magna Walker.
Crytus magnus Walker, List.

"Dark luteous, disc of thorax and transverse spot on abdomen black. Length 7 lines. Expanse 13 lines.

"Dark luteous, luteous pilose. Head black, luteous pilose, antennae piceous, third joint (except base) black. Disc of thorax and transverse bands to base of abdominal segments bronzy-black. Tarsi pale, the ungus black. Tegulae pale fuscous. Wings lutescent, veins brownish."

Habitat.—Georgia. Type in British Museum.

Pialeoidea metallica

Pialeoidea metalliea Williston, Biologia, Dipt., i, p. 165.

"Thorax metallic green; abdomen brown, shining, the segments with paler hind margins; legs reddish yellow; wings brownish. Length 5–6 mm.

"Hab. Guatemala, Antigua (Stoll).

"The third joint of the antennae is broken and for that reason I cannot refer the species to the genus *Pialeoidea* Westwood, with certainty. The head is remarkably small, the eyes separated by a narrow front, and the wings very near like those figured by Westwood; the scutellum is rather broad; but there are three instead of two ocelli; and the occiput is very much developed (as in Westw., l. e., fig. 3a), and if seen from the side it occupies one half of the breadth of the head (differing therefore from l. e., fig. 3b). The venation differs in the following principal points: the second basal cell is connected with the margin of the wing by a vein running between the fifth posterior cell and the anal cell (in the figure quoted this vein is omitted, and these cells coalescent; is not this omission accidental?); the fourth posterior cell is not in contact with the second basal cell; and the second submargina cell is of a different shape, *e. g.*, longer and broader at the base.

"The vertical triangle is large, somewhat protuberant; the ocelli equidistant. The eyes pubescent; beneath the vertical triangle approximate but without coming in contact; below the antennae almost touching. The antennae are inserted in the middle of the head, within a space formed by an emargination of the eyes; their basal joints in close contact. Proboscis short.

"Head black; basal joints of the antennae brown; the vertical triangle greenish metallescent. Thorax metallic green, beset with scattered, erect, moderately long, yellowish hairs; scutellum more bluish metallic. Abdomen brown, hind margins of the segments with a whitish border, both on the dorsal

and on the ventral sides; pubescence short, dark, and little conspicuous on the upper side; paler hairs toward the tip and on the venter. Stem of the halteres brownish; knob whitish yellow. Tegulae pale with a pale brownish border. Coxae blackish, paler at the tip; legs brownish-yellow; ungues black. Wings pale brownish, somewhat darker along the costa, and lighter within the basal cells; costal and first veins dark brown; the first vein becoming perceptibly stouter toward the tip. A single female.

"N. B. The hind part of the mesonotum being injured by the pin, I cannot describe the praescutellar callosities, etc."

APELLEIA

Apelleia Bellardi, Saggio di Ditt. Messic., Append., p. 17, (1862).

Osten Sacken published a note on *Apelleia*,[3] and it appears

[3]Berlin. Ent. Zeitschrift, xvii, p. 297.

that the genus holds a rather precarious position. *Apelleia* differs from *Ocnaea* Erichson in its glabrous eyes only. *Exetaxis* Walker also has glabrous eyes (judging from the plate, the author making no mention of it), and shows other differences, especially in the venation, and yet is considered a synonym of *Ocnaea*. The genus *Ocnaea*, however, shows considerable variation in venation. Osten Sacken had a new species from Central America at the time of writing the above article which was an *Ocnaea*, except for its glabrous eyes, and therefore agreed with *Apelleia*. Professor Bellardi correctly compared *Apelleia* to *Eriosoma* Macquart and *Exetaxis* Walker and gave the differences, but both of these genera are now considered synonyms of *Ocnaea*.

(Transl.) "Body pilose. Eyes bare, very finely and uniformly reticulated. Two ocelli, moderately distant. Antennae inserted on the vertex, exceeding the head in length, and almost contiguous at the base; three joints, the first short, the second a little longer, third much longer and linear, without a style. Proboscis short. Abdomen subspherical. Femora incrassate, the tibiae large (swollen) at apex, spurred. The first joint of the tarsi longest; the second, third and fourth joints of the posterior tarsi long but not equal to the first. The second, third, fourth, and fifth joints of the anterior tarsi short, subequal. Two submarginal and five posterior cells, the first posterior divided by a cross-vein and closed in the margin."

Apelleia vittata

Apelleia vittata Bellardi, l. c.

(Transl.) "Male. Fuscous, yellow vittate. Head small, depressed in front. The eyes are finely and uniformly reticulated, contiguous at the base of the antennae and at the epistoma. Vertex small, dark brown, rather long brown pilose. First and second joints of antennae short and subequal, the third twice the length of the first two. The palpi yellowish pilose. Thorax convex and covered with dense yellowish pile, yellow in ground color. Three large longitudinal fuscous vittae, the median reaching from anterior margin to scutellum, those on the sides not reaching the anterior margin and joined with the median vitta at the base. Pleura flavous, pectus dark brown. The scutellum is large, yellow and with yellow pile. Halteres luteous, knobs fuscous. Abdomen large, short, broad and rather rounded; very convex, and with yellowish pile. The abdominal segments all fuscous, with stripe on posterior margin, the band about equal in width to one-third of the segment; yellowish red in color, the posterior and lateral margins contiguous. Venter concolorous, in small part fuscous, the bands largely yellow. Legs all yellowish brown, except the apex of the fifth joint of the tarsi of anterior legs, and second, third, fourth and fifth joints of posterior tarsi which are black. Posterior claws long, pointed and black; the anterior claws mostly rufous. Wings yellowish, at base subhyaline, longer than the abdomen.

Length of body, 11 mm. Wing expanse, 26 mm."

Habitat.—Playa Vicente, Mexico (Sallé). Coll. Bellardi.

OCNAEA

Ocnaea Erichson, Entomographien, p. 155, (1840).
?Eriosoma Macquart, Dipt. Exot.
Exetaxis Walker, Insecta Saunders.
Ochaea Hunter, Trans. Amer. Ent. Soc. Phila., xxii, p. 151.

Head rather short and occiput not swollen. Proboscis very short, covered by the lower point of the face. The antennae are placed on the vertex, almost erect, longer than the head, three jointed, the first two joints short and the third long and varying in shape. The second joint with a few hairs above. The eyes are rather long and dense pilose and meet below the antennae. Erichson in his description of the genus, noted that by close observation a small line-like space was seen between the eyes in the whole length from the vertex to the face. In the known species from North America there are two ocelli on the vertex, placed on the front rim of a rather broad tubercle. The thorax and abdomen are thickly and finely, almost silky haired. Humeral callosities large. Scutellum short. Abdomen rather short and broad, but not greatly swollen as in some genera. In the female

the wings reach a little beyond the tip of the abdomen. The venation varies somewhat in different species but the general type is the same.

According to Erichson this genus comes near *Astomella*, the resemblance being like that of *Lasia* and *Panops*. The species are of good size for this family.

Synopsis of Species

1. Species without black markings ..... **micans** Erichson
   Marked with black on the abdomen 2
2. All longitudinal veins reach the wing margin 4
   Some of the longitudinal veins do not reach the margin 3
3. First posterior cell closed; lateral margins of abdominal segments yellow. **helluo** O. S.
   First posterior cell open; lateral margins of abdominal segments black. **coerulea** new species
4. Thorax and scutellum black ..... **schwarzi** new species
   Thorax and scutellum largely yellow; third antennal joint club-shaped. **loewi** new species

Ocnaea micans

Ocnaea micans Erichson, Entomographien, p. 155, (1840)

(Transl.) "Fuscous, thorax shining and with ashy hair, second and third segments of abdomen testaceous. Length 4½ lines.

"Antennae black, the base testaceous, third joint elongate, linear, before apex enlarged, apex pointed (third joint club-shaped). Head black, black pilose, hypostoma acuminate. Thorax fuscous, dorsal prothoracic lobes and mesothoracic callosities before scutellum testaceous, clothed with thin ashy hair, silky, shining. Abdomen thinly gold pubescent, fuscous, below concolorous, above the second and third segments testaceous, small triangular basal spots are fuscous, apex of fourth and fifth margined testaceous. Legs fuscous, base of femora, knees and tarsi testaceous. Wings yellowish hyaline, two submarginal cells, five posterior, three discoidal. Squamae hyaline, margined brown. Halteres blackish."

Habitat.—Mexico. Collected by Deppe.

Ocnaea helluo

Ocnaea helluo O. S., Western Dipt., p. 278, (1876).

"Two submarginal cells; five posterior cells, the first divided in two by a cross-vein, and the second half of it closed and petiolate; all the longitudinal veins reach the margin; body black, beset with short yellowish pile; hind margins of the abdominal segments with broad yellow borders, expanding along the lateral margins; legs yellow, including the coxae. Length 13–14 mm.

"The venation is like that of *O. calida* Wiedemann[4] with the following modifications: 1. The third vein emits a branch some distance beyond the cross-

[4] Auss. Zweifl., ii, tab. VII, f. 2b.

vein dividing the posterior cell; thus a second submarginal cell is formed; 2. The cross-vein in the first posterior cell is just opposite the cross-vein at the base of the second posterior cell, and not far beyond it as in Wiedemann's figure; 3. The vein between the second and third posterior cell reaches the margin; 4. The fourth posterior cell, which is closed, is much longer, forming an irregular parallelogram with a cross-vein at its base. Antennae dark brown, basal joints reddish, the elongated third joint also somewhat reddish on the inner side. Thorax black, shining, and clothed with dense and soft yellowish gray pile, almost rendering it opaque; humeral callosities whitish yellow; antealar callosities brownish. Abdomen black, densely clothed with short, erect, yellow pile; all the segments with broad, clay-yellow hind borders. Legs including coxae yellow, the extreme end of the last tarsal segment and ungues black. Wings very slightly tinged with brownish; costal cells a little more saturate.

"Hab. Dallas, Texas (Boll). One specimen.

"Observation.—This fine species is not unlike Erichson's figure of *O. longicornis* (Entomographien), but the venation is different, the black on the abdomen occupies more space, the hind tibiae are brown, the abdomen much stouter; the size is larger by one-half than the figure."

Dr. Williston published a note on this species in these TRANSACTIONS. In this specimen the outer first posterior cell was but slightly coarctate, not closed and petiolate; otherwise it agreed well with the description.

Ocnaea schwarzi new species (Plate III, fig. 13.)

Head black, the mouth opening apparent; short yellowish palpi. Thorax and scutellum metallic blue black, clothed with silky brown pile which has yellowish gray reflections in certain lights. Antennae black with dull reddish color in places, the third joint velvety. Humeral callosities yellowish, a small obscure reddish yellow spot on the thorax just back of them. Squamae grayish hyaline with blackish brown margins.

First segment of abdomen short and bulging out above the second. The posterior half and sides of the abdomen brownish yellow; the basal cross bands metallic blue black with soft brown pile. On the fifth segment the black is confined to a median spot. Venter yellowish with the bases of the segments broadly brown. Pleura blackish brown, the color extending down on the coxae.

Legs brownish yellow; the tibiae with two spurs, the outer one large. Tips of tarsi and claws black, the pulvilli rather small and with longer fringe than usual. Pile of legs short, yellowish gray and shining. Wing veins strong and black, the membrane gray hyaline, a little brown along the costa. The vein between first and second posterior cells does not reach half way to the margin. In one wing the vein between the second and third posterior cells stops a little short of the margin. Length, 9.5 mm.

Habitat.—Cayamas, Cuba. (Schwarz coll.)

The holotype, a male, is No. 21207 in the United States National Museum.

Ocnaea loewi new species (Plate III, fig. 12.)

Head blackish brown, vertex lighter. Eyes black. Body dull yellow, brownish in places. The face reduced to a small protuberant triangle, black in color and very short. Mouth opening apparent; mouth-parts rudimentary as in others of the genus and yellow in color. Eyes with rather long, yellowish brown hair. First two joints of antennae short and brownish yellow, the third joint except the brownish base, and club-shaped (see fig. 12b). The inner side of the third joint with a yellow longitudinal stripe and with a few short hairs at the tip.

Thorax brownish yellow. A dark brown wedge-shaped mark on dorsum, broad anteriorly and narrowing to a point a little beyond the center. On each side of this, above the root of the wings is a dark brown spot of irregular shape. Thorax with rather long golden yellow pile, blackish brown around bases of coxae. Scutellum yellowish brown with yellow pile.

Abdomen very broad and brownish yellow in color, with yellow pile. Segments two, three, four and five with basal black bands which do not reach margins; on third, fourth and fifth they are broader in the middle. Venter brownish yellow, the first three segments mostly blackish, and as on the chest (pectus) with thin gray pollen. Posterior margins of the first three segments irregularly and narrowly yellowish.

Legs quite strong and yellow in color. Tibial spurs brown and claws black. Tip of last tarsal joint dark brown. Legs with short yellow pile. Wing venation conforming to the general type. Anal cell very short petiolate. Lower branch of third vein does not reach wing margin. Fifth posterior cell closed in the margin, not long petiolate as in *O. schwarzi*. The costal, subcostal, marginal, most of submarginal and upper half of first posterior cell thickly covered with minute hairs. This is an unusual thing in the Cyrtidae. Length, 9 mm.; wing, 9 mm.

Holotype, a female, in the Museum of Comparative Zoology at Cambridge. The specimen is labelled "Loew" and with a square orange label, which denotes that it was collected in Texas. This species must be near *O. micans* Erichson.

Ocnaea coerulea new species (Plate IV, fig. 14.)

Head black and very short (see fig. 14a). Eyes thickly black pilose. Palpi yellow with yellow hair. Antennae blackish brown, the third joint very long and grooved or hollowed out on the outside as in *O. schwarzi* (see fig. 14b).

Thorax, scutellum, pleura and coxae thickly covered with silky, yellowish gray, erect pile. Thorax and abdomen very dark metallic blue, almost black. Pleura and coxae brownish black with a purplish luster. Fore coxae marked with yellow. The humeral callosities yellow and some brownish yellow color on the praescutellar callosities. Hind margin of scutellum yellowish. Squamae hyaline, with whitish yellow pile and yellow brown margins.

Abdomen thickly clothed with a yellowish gray, silky pile, which has a purplish brown sheen in certain lights. Hind margins of segments two, three and four yellow, the yellow not meeting in the center; on the third segment the yellow is quite widely separated. The yellow does not attain the lateral margins (see fig. 14). Venter black with purplish metallic reflections and irregular yellow spots near the lateral margins of the segments. Genitalia yellowish.

Legs yellowish, the two front pair with brown below. Hind legs dark brown above. Claws and tips of last tarsal joints black. Wings hyaline, the veins brown and distinct. The longitudinal veins reach the wing margin. The cross-vein in the first posterior cell is beyond the cross-vein at the base of the second posterior, thus differing from *helluo* O. S., from which it also differs in having the first cell widely open. The fork at the end of the third vein is very wide. Length, 12.5 mm.

One specimen, a male, collected at Austin, Texas, November 11, 1899.

Type.—In the collection of Prof. A. L. Melander.

There are six other species of this genus: *calida* Wiedemann, *longicornis* Erichson, *lugubris* Gerstaecker, and *tumens* Walker from Brazil; one species, *trichocera* O. S., from Panama; one species, *grossa* O. S., described from Costa Rica. The last named species is figured on Plate IV, figure 15; being redrawn from Van der Wulp's figure in the Biologia.

LASIA

Lasia Wiedemann, Anal. Ent., p. ii. Ausser. Zweifl. Ins., i, p. 329, (1824).

Flies of good size, some of the species being very large. The proboscis is very long, projecting beyond the tip of the abdomen when at rest. The base of the proboscis is covered with a prominent shield; the labellae are slender and scarcely to be distinguished from the rest of the proboscis. Apparently there is no face, the proboscis coming out about the middle of the head, in profile just below the antennae. Head composed almost entirely of the eyes, the occiput even more restricted than is usual in the family. Frontal triangle very small. First joint of the antennae almost buried in the head, second joint short and cylindrical, third long and cylindrical, or more or less compressed, usually pointed. The eyes are pilose and are contiguous above the antennae (see Plate II, fig. 11a). The ocellar tubercle is said to be very prominent in a few species, as in *L. ocelliger*, which is described as having one ocellus. The usual number of ocelli is two.

The body is more inflated than in *Eulonchus* as a rule (see Plate II, fig. 11). Pleura inflated, the humeral calli quite large. Thorax and scutellum distinctly pilose in most species. Scutellum rather short and wide. Abdomen large and swollen. Male genitalia of the same general type as found in the other genera of the family. The female genitalia are retracted. Legs moderately strong, with a tooth-like apical spur above and a sharp projection below. Wings rather long and narrow with a very complex venation. (See Plate I, fig. 1.)

Wiedemann described three species in two genera, of which he placed the one in the Bombyliidae, the others in the Cyrtidae (Henopier). The latter he took as identical with *Panops* Lamarck, with which it undoubtedly agreed in the long proboscis and the three-jointed antennae, but in the location of the latter it differed. Macquart correctly recognized the relation of Wiedmann's *Panops* and *Lasia,* but followed Wiedemann in that he placed the Brazilian species under *Panops* Lamarck; their proper place is in the genus *Lasia.*

The venation of *Lasia,* which has been explained in the general summary of the family, is very close to that of the Nemestrinidae. The auxiliary, first, second and third veins are simple, the first and auxiliary veins being long. The third vein has a short praefurca, a thick discal cross-vein arising near it, running almost parallel with the upper branch of the third vein until near its end where it goes into a fork, the branches about equal and ending before the wing tip. At the fork is a supernumerary cross-vein tying the third vein to the upper branch of the fourth longitudinal near the end of the discal cell. The discal cell is very long and narrow and emits three veinlets, the upper in line with the upper side of the discal cell, the second sloping down somewhat, the third recurrent and closing the fourth posterior cell. The fifth vein is forked in almost the usual way and the upper branch just connects with the discal cell (no cross-vein), then diverges until caught by third vein from discal cell, bends down to wing margin. Lower branch of fifth longitudinal slopes down and joins anal vein, closing anal cell considerably before margin. First basal cell short and broad, but the long cell above the discal cell is really a portion of the first basal and not a portion of the first posterior cell. Second basal rather long and narrow. The discal cell is absent in *Hirmoneura* (Nemestrinidae).

The species in this genus are distinguished from *Panops* by their geographical range, metallic colors and the position of the antennae. They differ from *Eulonchus* in the structure of the proboscis, the absence of the palpi and there is a slight difference in the venation. The eyes are widely separated below the antennae.

Lasia klettii

Lasia klettii O. S., Report on Wheeler's Survey, v, Zoology, p. 804, (1873).

"Metallic green; feet black. Length, 17 mm. (through body end to end). Altogether metallic green, with golden reflections, the upper side finely and evenly punctured; venter more bluish; feet altogether brownish black, by one half longer than the body; antennae very short, black; base of third joint slightly reddish; this joint more than twice as long as the first two together, gradually tapering toward the tip. Wings distinctly infuscated; tegulae brownish, bordered black. Alcohol took off all pubescence; some vestige on thorax proves that it was clothed with short pale hairs.

"Camp Apache, Ariz., September, 1873. Collected by Francis Klett.

"Observation—I place this species provisionally in the genus *Lasia*, to which it is related. It differs from Wiedemann's figure of *Lasia* in the fact that the second longitudinal vein ends in the first and not in the costa. It differs from *Eulonchus* in the eyes being contiguous between the antennae and the vertex only, and not above and below the antennae. The abdomen is very convex; it is broad and cut squarely at the base; broad and blunt at the tip (not tapering as in *Eulonchus*). In the figure the hind tarsi are broken off."

Dr. Williston published on this species in these TRANSACTIONS. He had two specimens of a large and beautiful Cyrtid from New Mexico. "The species is almost entirely bare, the sparse, short, black and light colored hairs on the dorsum of the thorax are hardly discernible. In the South American species of the genus *Lasia* there is always considerable vestiture. This fact and the termination of the second vein in the first makes its location in the genus doubtful. In these specimens I can see scarcely any golden reflections, but, on the contrary, a pronounced blue or violet reflection, almost obscuring the green of the abdomen of one. The stumps of veins on the anterior branch of the third vein and near the tip of the fourth vein are wanting."

If the two specimens above mentioned are the ones now in the Kansas University collection, and it is very probable that such is the case, they should be placed under *Lasia scribae* O. S.

Lasia scribae

Lasia scribae O. S., Biologia, Dipt., i, p. 166, (1887).

Male. "Thorax metallic green, with violet reflections, abdomen metallic violet, with bluish and greenish reflections towards the end; legs black; antennae broken but probably black; wings with a brownish tinge. Length, 17–18 mm.; proboscis, 18 mm.

"Hab. Guatemala (coll. O. S.).

"In one of the specimens the violet (amethystine) reflections on the thorax takes distinctly the shape of stripes—in the middle a pair of longitudinal stripes, abbreviated behind, and, on each side, another stripe, abbreviated in front; in the other specimen these stripes are not so distinctly marked. The surface of the thorax and abdomen are finely but densely punctate. A pale yellow, more or less recumbent pubescence is visible principally on the anterior half of the thorax and on the last two segments of the abdomen; on the pleurae are more dense and villose pale yellow hairs; some stiff black hairs among the yellow ones on the thorax, especially around the root of the wings and the base of the scutellum. The pubescence of the eyes is a generic character. The tarsi, especially on the under side, are beset with short rufous hairs, so much so that the hind pair appears rufous, although the ground color is black. Tegulae yellowish-brown with a black margin. Wings with a uniform pale brownish tinge, with black veins; the second vein ending in the first close before its tip; the anterior branch of the third vein reaching the costa at the tip of the first vein. Two specimens (the one is a male, the other has the end of the abdomen injured). I dedicate this species to Dr. Scriba, who kindly gave me the specimens.

"N. B.—The venation of this species differs from that of the *Lasiae* whose wings have been figured by Wiedemann,[5] or by Guerin:[6] the second vein ending in the first, and not in the costa, and the anterior branch of the third vein reaching the costa at the very end of the first vein.

"That the venation in the genus *Lasia* is not always the same is proved by *L. klettii* O. S. in which the second vein reaches the costa at the end of the first. The species is from Arizona, and not unlike *L. scribae* in its general appearance."

Lasia auricoma Westwood, from Brazil, to judge from the description, may resemble *L. scribae;* but it is only half an inch long; the tarsi are said to be "lutei," the tegulae "chalybae."

Two male specimens in the Kansas University collection answer the description of *Lasia scribae.* These two specimens are determined *Lasia kletti* O. S. and have a label "det. S. W. Williston." They are very probably the two mentioned above under *L. klettii,* on which Dr. Williston published in these TRANSACTIONS. The larger specimen answers the description on *L. scribae* almost per-

[5] Ausser. Zweifl. Ins. i. t. 4. f. 3. and ii. t. 9. f. 2.

[6] Iconogr. t. 94. f. 9.

fectly and has the three purple stripes on the dorsum of the thorax well defined. Length, 16.5 mm.; length of proboscis including basal shield, 23 mm.

The smaller specimen (Plate II, fig. 10) is more blue green and less purple. The infuscation of the wings is paler and there is none of the black pile on the thorax at the base of the wings, and on the pleura. The femora are blackish purple instead of black and the pile on the tibiae and tarsi pale. The tibiae are blackish with a purple luster, tarsi brown, the pile quite long and thick. The hair of the eyes is distinctly longer and yellowish white. Antennae blackish brown, second joint with a few short hairs, third joint pointed and yellowish at the extreme base. Squamae purplish brown with black rims. Genitalia clothed with yellowish pile, longer than on the rest of the abdomen, and about the same color and length as that on the venter. The venter is entirely metallic purple. Length, 14.5 mm.; length of proboscis, 16 mm.

A single specimen in the National Museum is very near *scribae*. It is labelled "Coll. C. V. Riley" and is determined *Lasia scribae* with a query. The wing is shown on Plate I, figure 1. The eyes are thickly covered with short brown pile; the occiput closed with black pile. Pleura and humeri with long fine black pile. Venter shining brown with purple and coppery green reflections, thinly covered with rather long black pile. The pile on the squamae and pleura is wool-like and long. The legs in this specimen are badly broken up but were apparently brownish in color. Coxae with a purplish color.

One specimen, from Mexico. Length, 18 mm.; proboscis, 19 mm.; wing, 15.5 mm.

EULONCHUS

Eulonchus Gerstaecker, Stett. Ent. Zeitg., xvii, p. 359, (1856).

Head rather flattened in front. Antennae in center of head in profile. First two joints short and cylindrical, the third long and strap-shaped, and ending bluntly or in a point. As in the rest of the family the head is composed almost entirely of the compound eyes. Eyes contiguous, or nearly so, for some distance above and below the antennae. The ocellar triangle is usually high and wart-like, and there are three small ocelli, the front one on a

separate projection of the tubercle. The proboscis is greatly elongated, reaching beyond the end of the abdomen in *smaragdinus*. The tip of the proboscis is pronged, the labella being very large, as in the genus *Bombylius* (Bombyliidae). Near the base of the proboscis are the rather small palpi, slender, pencil-shaped and with several fine bristles at the tip.

Thorax not so strongly convex as in some of the other genera and the abdomen more slender. Scutellum small, short. Abdomen six-segmented and tapering. The male genitalia are plainly visible. Thorax and abdomen covered with fine pile which does not conceal the ground color. Legs rather slender but not weak, the tibiae spurred. Wings of good size, the venation much as in *Lasia*, but the marginal cell is widely open and the veins inclosing the second submarginal are diverging at the tip and not parallel or converging.

This genus, as Gerstaecker noted in his original description, is close to *Lasia*, differing in the insertion of the antennae and in the more elegantly formed body. *Eulonchus* also differs in the possession of palpi and eyes that are contiguous below the antennae.

Synopsis of the Species

1. Legs altogether yellow 3
   Legs, or at least femora, black 2
2. Tip of femora and greater part of tibiae whitish yellow, the tegulae uniformly white ..... **tristis** Loew
   Legs altogether black, only the knees paler, tegulae margined with black. **marginatus** O. S.
3. Proboscis curved and longer than the abdomen; usually quite large and metallic green in color ..... **smaragdinus** Gerstaecker
   Proboscis straight and as long as the abdomen, often shorter; smaller species, blue, green or purple in color ..... **sapphirinus** O. S.

Eulonchus smaragdinus (Pl. IV, fig. 16.)

Eulonchus smaragdinus Gerstaecker, l. c.

"The body is of a beautiful, shining emerald green, that on the scutellum shows a slight tinge of bluish; the thorax is above as well as below thickly covered with long downy yellowish hair, which stretches back to the scutellum. Much finer and sparser, the hair on the abdomen is also more on the sides, where it is especially heavy on the hind margins of the segments and thickest on the third and fourth. The long hair of the eyes, which is thick and brushy, shows a paler yellow color, more of a whitish. On the antennae the first two joints and the base of the third are tinged reddish, the large part of the latter blackish, however. The legs are, with the exception of the coxae, which are the color of

the body, a weak yellow, the tarsi darker, more of a reddish color; of like color are the halteres also. The wings are hyaline, the veins blackish brown, the costal border reddish to the tip; the squamae are tinged brownish yellow.

"Two, judging from the slender body, male specimens, from California."

Osten Sacken collected this species in California and notes the following: "Not uncommon on the sands about Lone Mountain, San Francisco, according to Mr. H. Edwards. The three specimens which I have are females. Two males from Mr. Edwards are smaller (one only 10 mm.), the proboscis is shorter, although still exceeding the abdomen in length; the coloring is bluish on the thorax, purplish on the abdomen. Are they males of this species? If they are, Dr. Gerstaecker was mistaken in describing his green individuals with long proboscis as males."

A. L. Melander gave some notes on two specimens of this species,[7] both green females, measuring 8 and 10 mm. These were taken in Marin County, California. In the specimens I have studied the pile is more golden yellow and thicker, especially on the thorax and abdomen, than in *E. tristis*. The legs of most specimens are bright yellow, a black spot on the hind tibiae covering the spur. The halteres are yellow. The ocellar tubercle is not so high as in other species of the genus. The first two joints of the antennae are yellowish brown, and the proboscis is very long. The second submarginal cell petiolate, the anal cell closed in the margin. One specimen from Los Angeles, California, measures 11 mm., the proboscis, 16 mm.

Two smaller specimens from Santa Monica, California (one of which is shown in fig. 16), have very little bluish reflections and the antennae are dark brown. Length, 8.5 mm.; proboscis, 9.5 mm.; wing, 7 mm. The ocellar tubercle in these is very small and rounded. One small specimen from North Monterey, California, is dark and metallic blue, the tarsi dark brownish and the antennae black. The base of the second submarginal cell is angular, with a suggestion of a stump as in *E. tristis*. The ocellar tubercle is high and bifid. A specimen from Stanford University, California, has the thorax bluish green, the abdomen green, and the tarsi darkened. The antennae are black, the third joint pointed and slender. The ocellar tubercle is rather prominent.

[7] Ent. News, xiii, p. 181, (1902).

I have two large specimens from San Bernardino, California, which are dull metallic blue with whitish pile and light brown antennae (Coll. Van Dyke, in the U. S. N. M.). The tarsi are darkened, the ocellar tubercle low. The coxae and the pleura just above are purple. These specimens are apparently males. Another specimen of the same size and from the same locality is green in color with darker yellowish legs. The body has a slight purple tinge and golden yellow pile. The antennae are pale brown, the third joint very slender and pointed. Length, 12 mm., wing, 11 mm. One of the males was figured in Dr. L. O. Howard's Insect Book. A specimen from Los Angeles, California, has golden yellow pile and a very long proboscis, with a low ocellar tubercle. One specimen from Claremont, California, is dark bluish green with black antennae and a low ocellar tubercle.

One specimen from the Giant Forest, California, collected July 21, 1907, at 7,000 feet elevation by Prof. J. C. Bradley, is in the Cornell University collection. This specimen is large and has a very long proboscis. Some specimens from Lake County, California, have a rather low ocellar tubercle, and are blue green in color with reddish yellow pile on the thorax. The venter is blue green with narrow yellow margins to segments two, three and four. In a specimen from Los Angeles County, California, the pile on the occiput, eyes, and squamae is golden and long. The vein between the discal cell and the outer first basal does not reach the wing margin. In examining a large series of this species it will be found that (as in *tristis*) the second submarginal cell varies from long petiolate to subsessile. It is the only species with a curved proboscis.

Eulonchus tristis (Pl. V, fig. 18.)

Eulonchus tristis Loew, Centuries, x, p. 236.

(Transl.) "Head green, shining, antennae and proboscis all black, palpi brownish black, ocellar tubercle as in *E. smaragdinus* Gerst., even larger, blue-black. Thorax bronze green, lower half of pleura and coxae blue, color of dorsum almost to scutellum inclined to be violet-purple, little shining. Venter steel green and more shining. Legs black, femora at apex, tibiae at base, at side and above, almost all the way to apex, whitish. Tegulae whitish; halteres pale yellow. Body furnished with close lutescent pile, thinner on the abdomen and shorter and paler. Wings hyaline, tinged with faint brownish."

A. L. Melander (104) has given some notes on *tristis*. The species is relatively common in Idaho, according to Professor Aldrich. The males sometimes have the third joint of the antennae sharp at the apex, but as a rule it is blunt in both sexes. One female from Marin County, California, has the abdomen brassy green; a pair from Idaho are blue-black. There is a great inconstancy in the juncture of the veins beyond the discal cell. In a California specimen the vein separating off the second submarginal cell is angulated near its base, and bears a short spur at the angulation; while in the Idaho specimens the vein is evenly bisinuate, although it bears a similarly placed short spur. The males have the second submarginal cell petiolate at the base; in the female it is pointed but nearly sessile, the very short petiole thickened; while outwardly the bounding veins of this cell diverge rather prominently, not being parallel as in the female.

A specimen from Stanford University (coll. Morrison) has the venter metallic blue-green, the dorsum of the abdomen bluish black with purplish reflections. The short yellow pile forms bands on the abdomen both above and below. The head and thorax are bluish green. Scutellum and thorax in front of it purplish. Femora brownish black, knees and tibiae yellowish, inner side of tibiae brownish. Tarsi and ends of tibiae light brown. Knob of halteres yellowish, the stem brown. Proboscis black, slightly longer than the body. Yellow hair on eyes and occiput; thorax and pleura yellow pilose.

This species varies as much as *smaragdinus*. One female from Muir Woods, California, has the second submarginal cell petiolate in one wing and not in the other. A male from Humboldt County, California, has the proboscis shorter than the body. In this specimen the abdomen is bright metallic purple and blue, also the humeri. The scutellum is purple, the tibiae yellowish brown, not darker on the inner side. A specimen from Kaslo, British Columbia, is larger than the average and is shining green with very little blue color. It is evidently a male but the antennae are blunt. There is a stump of a vein on the second submarginal at the base, the cell being petiolate.

In the collection at the Oregon Agricultural College there are twenty-eight specimens of *E. tristis*, taken at various places in Oregon and at various times. Most of the specimens were taken

as follows: Mt. Jefferson, July 15, 1907; Mary's Peak, June 6, 1915 (Lovett); Rock Creek; Buck Mountain, July 9 to 15. One specimen from Mt. Jefferson has an extra cross-vein in each wing, forming a supernumerary cell just beyond the outer first basal cell. Two specimens from Buck Mountain have the third antennal joint very large and broad. In another specimen the vein closing the fourth posterior cell is represented by only a stump in one wing. In two specimens from Mary's Peak the fourth posterior cell is not closed.

In the author's figure of *E. tristis* the anal cell is shown closed in the margin. In two specimens from Santa Cruz Mountains, California, the anal cell is petiolate. In these same individuals the ocellar tubercle is low and rounded. A specimen in the National Museum from Alameda County, California (Coquillett), has a short stump in the submarginal cell from the second submarginal. The third antennal joint ends very bluntly. All of these specimens and many others examined are darker in color than *smaragdinus* or *sapphirinus* and less metallic. The proboscis when at rest just about reaches the tip of the abdomen.

On June 18, 1917, I collected nine specimens of *tristis* near Parkdale, Oregon, in the upper Hood River Valley, at an elevation of about 3,000 feet. Four specimens were collected near the West Fork of the Hood River on lupines. The others were taken on some small white flowers near by. They appeared to be good fliers and were taken in the sunshine. One of the females taken in this lot has the second submarginal cell petiolate in one wing and sessile in the other. I have seen two other females with the second submarginal petiolate, so this character is not always reliable.

Eulonchus sapphirinus (Pl. V, fig. 19.)

Eulonchus sapphirinus O. S., Western Dipt., p. 276, (1887).

"Antennae black, sometimes brownish or reddish toward the tip; epistoma black or bluish black; ocellar triangle dark blue or purple, sometimes with greenish reflections, clothed with dense, erect, grayish yellow pile on the thorax; abdomen with similar but much less dense pile, and with an appressed yellowish white pubescence, visible in certain lights only; feet straw yellow; tarsi brownish toward the tip; wings grayish subhyaline, costal cells brownish yellow; costal and first longitudinal veins black on their proximal half, brownish yellow toward the tip; tegulae whitish, their margins yellowish, knobs of halteres yellow. The proboscis of the male does not reach the end of the abdomen, that of the female does not reach beyond it. Length, 9–11 mm.

"Hab.—Webber Lake, Sierra County, California, July 23 to 26. Not rare, flying in circles around flowers. Three males and two females. A male and a female from Calaveras County, California, June, have the proboscis a little longer than the abdomen.

"This species is easily distinguished from *E. smaragdinus* female by its smaller size, blue color, shorter proboscis, less yellowish wings; the two latter characters also distinguish the males, which are somewhat alike in coloring.

"All my specimens, as far as I can remember, were more blue when I took them, and seem to have assumed the purple and even greenish tinges, which they now have, in the process of drying."

A specimen from Siskiyou County, California, has dark brown antennae, lighter at the base; the body is green. One from Mt. Angel, Oregon, is dark green, with purple reflections on the abdomen. The antennae are short, dark brown, and with the third joint pointed. Proboscis a little longer than the body. Two specimens from Humboldt County, California, have very long wings. The third antennal joint is long and very slender. The second submarginal cell is hardly petiolate; legs dark, the femora brown, knees yellow; the tibiae are yellowish brown at the apex and on the inner side. Proboscis shorter than the body, which is dark bluish green and very flat. Perhaps this form belongs with *tristis* or is a variety.

A small specimen from Siskiyou County, California (Coquillett), is seven millimeters long. Thorax green with a blue tinge, abdomen azure. One specimen from the Wasatch Mountains, Utah (C. V. Riley), has the tarsi darker than the rest of the legs. Several specimens from Placer County, California, vary from blue to green. One specimen in the National Museum from Utah differs from any I have seen. The thorax is dark metallic blue. The humeri, occiput and scutellum are purple. Two median dorsal stripes of purple on the abdomen, and two short ones on each side. Legs straw yellow. Pleura blue with purplish reflections. Abdomen and venter purple. Antennae black, the third joint pointed. Femora light yellowish brown, the knees yellow; tarsi yellowish brown. Proboscis very short and black. Whitish pile on the eyes very short. Three submarginal cells, the cross-vein not placed the same in each wing. Costal cell yellowish.

On July 12, 1918, I made a trip to the country near the old lava beds which lie at the base of Mt. Hood, in the upper Hood River Valley of Oregon. About three weeks before I had found several

specimens of *tristis* in this region, as mentioned previously, and I hoped to find a few more specimens. The best collecting ground on the previous occasion was a little willow-covered sandy strip not far from the edge of the river. Lupines were growing in these open spaces where the big trees left off, and the specimens of *tristis* had appeared to have a preference for these flowers. They did not appear to feed on the flowers, but were flying around them and resting on the leaves in the bright sunlight. Strangely enough I took no specimens of *tristis* this time, but found *sapphirinus* quite common. Two pairs were taken in copulation and several others were seen. A series of twenty-four was taken on this trip, most of them not on lupines, but feeding in the little bell-shaped blossoms of the twin flower, in spots of sunlight which filtered through the forest canopy. In the sunlight they appeared a bronze color and were more noticeable than *tristis* as they flashed through the sunlit spaces. They were quite wary when not engaged in feeding and were swift fliers. Only three females were taken in this lot.

Eulonchus marginatus (Pl. IV, fig. 17.)

Eulonchus marginatus O. S., Western Dipt., p. 277, (1887).

"Metallic green, with bluish reflections on the scutellum, the anterior margins of the segments, etc.; venter metallic blue. Antennae black. Thorax clothed with dense pale yellowish white pile; abdomen with a short appressed pubescence, which forms whitish cross-bands along the hind margins of the segments. Legs black, and only the knees yellowish white. Tegulae with very distinct black margins. Wings subhyaline; all the veins dark brown, except the distal end of the costa and of the first posterior vein, which are reddish yellow. Proboscis a little longer than the abdomen. Length, 9 mm.

"Hab. Napa County, California (H. Edwards). A single specimen, apparently a male. The petiole of the second submarginal is subobsolete; as I have only one specimen I cannot say whether this is a permanent character of the species."

There are two specimens in the National Museum collection, and a typical one in the Kansas University collection, labelled "Calif., Baron." (See fig. 17.)

Cyrtinae

Schiner, and several dipterists following him, have placed *Pterodontia* in the Panopinae; Kertesz has done this in his "Catalogus Dipterorum." I believe that the genus is more nearly related to the forms in this subfamily.

PTERODONTIA

Pterodontia Gray in Griffith, Animal Kingdom, xv, p. 770, pl. cxxvii, f. 3, (1832).

The eyes occupy most of the head, which is small in proportion to the thorax. The face is small and on the extreme lower part of the head, the antennae being placed in its upper part. The back of the head is not inflated; the eyes are holoptic and thickly pilose. There are three ocelli on the small vertical protuberance. The antennae are short, three-jointed and close together at the base; the first joint is cylindrical, the second rounded, and the third varying in shape and smaller than the other joints.

The thorax is large and swollen and with more or less thick, erect pile. The humeral calli are not very large, but the post-alar and praealar callosities are of good size. There are no bristles or very long hairs on the body. The scutellum is of medium size and rather short, with a deep rounded margin so that only a small portion has a flat surface.

The abdomen is large and inflated, appearing round from above. The squamae are quite large and with short hair on the surface. The genitalia are retracted and the structure hard to make out. The tibiae are armed with apical spurs, or sharp projections, a small inner one (in species I have examined) and a stronger outer one. The legs are rather slender for the size of the insect.

The wings have a peculiar thickening of the costa, which in the male sex bears a spur or tooth; the females apparently lack this tooth. The second longitudinal vein curves up into an enlargement of the costa. *P. analis* shows the presence of two discal cross-veins. The outer first basal cell has merged into the discal cell. The lower branch of the fourth vein bends sharply downwards and meets the short upper branch of the fifth, then goes to the wing margin. In *P. virmondii*, according to Verrall, the outer discal cross-vein and upper veinlet from the discal cell have disappeared and there is apparently no upper branch to the fifth vein. This is also true of *P. flavipes*. *P. analis* has three posterior cells and *P. flavipes*, two. *P. johnsoni* new species apparently is a connecting link between these two types of venation; the outer discal cross-vein being suggested, but the upper veinlet from the discal cell has disappeared.

Synopsis of Species

1. Entirely black or blackish brown . . . . . **johnsoni** new species
   With more or less red or yellow on the body 2
2. Outer discal cross-vein present; three posterior cells. Small species. **analis** Westwood
   No outer cross-vein. Two posterior cells 3
3. Second abdominal segment mostly black; black spots on dorsum of third and fourth. Scutellum black. Western species . . . . . **misella** O. S.
   Larger species, usually with more yellow on abdomen. Scutellum yellowish or whitish in female. Eastern species . . . . . **flavipes** Gray

Pterodontia analis (Pl. VI, fig. 20.)

Pterodontia analis Westwood.

Pterodontia vix Townsend, Proc. Cal. Acad. Sci., iv, p. 607, (1895).

"Black, apical segments of abdomen fulvous, margin of squamae blackish, wings hyaline, veins whitish, legs pale. Length 2 lines. Expanse of wings 5 lines.

"Hab. Georgia.

"Type. British Museum.

"Black, shining, black pilose, finely punctate. Head black, eyes posteriorly brown. Antennae inserted above mouth opening, terminal joint slender and short, apex furnished with setae. Thorax and scutellum black. Abdomen hemispherical, two basal segments and spot in middle to base of next following segment black. All the rest of the apical part of the abdomen fulvous. Wings hyaline, iridescent, transversely rugose. Veins whitish and distinct; discal cell 'sub apicem alarum postice aperta.' Tegulae fuscous, margin blackish. Legs whitish, base of femora darkened, ungues black."

Townsend (141) described this species as *P. vix.* One specimen was taken in Southern California. Length, 5 mm.

Pterodontia flavipes (Pl. VI, fig. 22.)

Pterodontia flavipes Gray, in Griffith, Animal Kingdom, Ins., xv, pl. CXXVII, fig. 3, (1832).

♀. Head quite small, button-like, much as in the species of *Ocnaea;* seen in profile the occiput takes up about half of the head and is black, gray pollinose. Eyes and occiput long black pilose. Ocellar tubercle not very prominent. Antennae yellowish, small and inconspicuous, placed near the rim of the mouth. First joint of the antennae scarcely visible, second short and rounded, third short and flattened, with three terminal setae (see fig. 22a). The mouth-parts are aborted, but palpi are present.

Thorax large, shining black above and black pilose. Scutellum whitish yellow, thinly black pilose. Pleura and humeri brown, the upper pleura remarkably swollen. Praescutellar callosities whitish yellow. Squamae brownish hyaline with heavy blackish brown margins and blackish pile. Halteres dull brownish yellow.

Abdomen large and convex. First segment brownish, second segment yellow with a narrow anterior brown margin, and usually a median brown mark; third segment entirely yellow or with a small median brown spot on the anterior margin; the rest of the dorsum of the abdomen yellow. Venter brown, often marked with yellow. Pile of abdomen blackish, erect and fine, and not thick enough to conceal the ground color. Femora brown with dark brown pile. Tips of femora, the tibiae and tarsi whitish yellow with pale yellowish pile. Tips of claws black. Wings faintly infuscated, darker in costal region. Costa thickened at end of first vein. Wing veins brown. Length, 7.5 mm.

♂. Very much like the female. The thorax is broader and more robust. The four posterior femora blackish, except tip. Scutellum and praescutellar callosities darker. Pleura usually much darker, in some specimens almost black. Costal margin at end of first vein bulges out and has a spur or tooth-like projection on it. Wings in some specimens pure hyaline. Veins brown at base, pale at apex. Knob of halteres darkened. Venter dark brown with whitish incisures.

Mr. J. L. King, in his paper on the life history of this species, recorded that twenty-four females varied from four to eight millimeters in length. A number of male specimens varied from six to nine millimeters. *P. flavipes* is an eastern species, possibly going as far west as the Rocky Mountains. This species is said to be near *P. virmondii* Erichson, and I have a specimen of *P. mellii* from Queensland, Australia, which is almost the same. There is no difference in structure or wing venation. The median black mark on the abdomen of *P. mellii* reaches to the tip, the last segment and the genitalia being black. The middle tibiae and the hind pair are black also.

Pterodontia misella

Pterodontia misella O. S., Western Diptera.

"Black; clothed with black pile; scutellum black, obscurely reddish on its latter half; second abdominal segment (that is, the first visible segment; the first true segment is concealed under the scutellum) black, with an obscurely marked reddish spot on each side a little back of the scutellum; segments 3 to 6 rufous, the third and fourth with square spots in the middle, that on the fourth being narrower; they are confluent with each other and with the black of the second segment. Venter rufous; hind margins of segments 2 to 5 black. Tegulae brownish, with broad dark brown margins. Legs brownish yellow, the four posterior femora black; ungues reddish, black at the tip. Wings subhyaline; veins yellow; venation similar to that of the other species; the usual tooth on the edge of the costa, near the end of the first posterior cell, is very little projecting. Length, 5 mm.

"Hab. Oregon (H. Edwards). A single specimen. This species is very like *P. flavipes* from the Atlantic States, but is smaller and differs in the coloring of the abdomen."

I believe that *Nothra americana* is the same as the form known as *P. misella*. I have seen males of *misella*, 7.5 mm. in length, and two specimens with a yellowish scutellum. The males of this species are almost impossible to separate from *P. flavipes*, and I would have been inclined to make it a synonym of that species, had I not recently seen two females. These females have a black scutellum and the prescutellar callosities are black. The species is distinctly smaller than the average specimens of *P. flavipes*. One of the above females was collected at Forest Grove, Oregon (M. C. Lane), the other near Corvallis, Oregon (A. L. Lovett).

Pterodontia johnsoni new species (Pl. VI, fig. 21.)

Body wholly blackish, semi-shining. Eyes contiguous and pilose; the pile on the eyes of the type specimen shorter than on *P. flavipes*. Head black. Antennae brown with the usual terminal setae. Humeral and praealar callosities black. Thorax with black pile. Squamae brownish hyaline, not so pointed as in *P. flavipes* and with black borders; the surface with black pile.

The sides of the last three abdominal segments have a brownish tinge which extends almost to the middle of the segment. Venter mostly blackish, with some reddish brown color. Femora black with a slight brownish tinge; tibiae dark brown, the tarsi paler. Tips of the claws black. All the tibiae with two spurs, the inner one very short but the outer one quite conspicuous. Knees brownish yellow. The wing venation is very near that of *P. flavipes*, but, in the type specimen at least, there is a suggestion of the outer discal cross-vein, although there is no upper veinlet from the discal cell. Thus the wing is intermediate between the type of *P. analis* and *flavipes*. There is a brownish color in the costal cells, the rest of the wing being whitish hyaline. Length, 5.5 mm.

Habitat.—Seattle, Washington.

Type. In the collection of C. W. Johnson, from whom I received the specimen. The type is slightly mutilated. Two legs and a part of one wing, which had been broken off, mounted on a separate card point.

There are two paratypes in the collection of Prof. J. M. Aldrich, taken at Boise, Idaho. They are a little lighter in color than the type. The vein closing the discal cell is not so angulated. Ocellar tubercle higher than in *flavipes*. Femora dark brown. Prof. A. L. Melander loaned a specimen collected at Coupeville, Washington, July 20, 1898, which is practically the same as the Idaho specimens.

NOTHRA

Nothra Westwood, Trans. Ent. Soc. London, p. 514. (1876.)

(Transl.) "Proboscis short. Antennae small and with fine terminal setae, inserted on the lower face. Eyes contiguous in front, hairy. Two ocelli. Dorsal prothoracic lobes distant. Abdomen hemispherical. Wing veins arranged as in *Pterodontia*, costa, however, not at all spurred, discoidal cell furnished with a short external appendiculate vein."

The type of the genus is *N. bicolor* from Australia.

Nothra americana

Nothra americana Bigot, Annales, 1889, p. 320.

(Transl.) "Antennae fulvous, the first joint blackish; the eyes covered with long black hair; thorax, scutellum, shining black and black pilose; squamae whitish, the borders black; abdomen reddish (thinly covered) with brownish hair, the base of the first and second segments ornamented with a large triangular spot, black, venter with bands of the same color; cornae black, the hair black; legs a pale yellow, base of the middle and posterior femora blackish; the empodia well developed; wings tinged with a yellowish color, the outer border grayish, the veins brown.

"Hab. Boreal America - Wash. Territory. One specimen, in the French Museum."

As previously stated the occurrence of this genus in North America is very doubtful. I have never seen a specimen of *Nothra*, but from the description it is very close to *Pterodontia*. Bigot probably had a species of *Pterodontia*. In fact *P. rusella* O. S., from the same locality, fits the above description, and the female has no spur on the wing at the end on the first vein.

OPSEBIUS

Opsebius A. Costa, Rendic. d. Soc. R. Borbon. Acad., Napoli, v, p. 20. (1856.)
Pithogaster Loew, Wien. Ent. Monatschr., i, p. 33. (1857.)

The head is small and far down on the thorax so that it can hardly be seen from above. The eyes are hairy and in large part holoptic; the occiput is swollen. The proboscis is very short and the mouth-parts atrophied. The antennae are inserted on the vertex as in *Acrocera*, but are much longer as a rule and the arista even more slender. There are three ocelli, the front one least conspicuous. The humeri are widely separated. The thorax is very large and bulging, almost spherical in shape, and clothed with thick fur-like hair. The pleura are swollen

as in some of the other genera. The callosities of the thorax are not very large and the scutellum is rather small and short, as in *Acrocera*. The squamae are noticeably smaller in proportion than in most of the genera, and are not bulging as in *Ogcodes* and *Acrocera*. The halteres are of medium size.

Abdomen large, appearing more square than conical in outline, with short fine pile. The legs are quite slender. Discal cell long and narrow, the proximal end pointed. Cross-veins rather far from wing margin, so that the posterior cells are long. The wing veins are strong and reach the wing margin. The third vein is branched; four posterior cells, the first is separated from the outer first basal by a remarkable cross-vein. Anal cell closed in some, widely open in others. Anal angle of wing much reduced. One species, *pterodontinus*, has a large tooth on the costa, as in the genus *Pterodontia;* this tooth is heavier, however, and nearer the proximal end of the wing than in that genus.

Synopsis of Species

1. Wing with costal spur as in genus *Pterodontia* . . . . . **pterodontinus** O. S.
   Wing with costa thickened, but without a spur 2
2. Anal cell closed; third posterior cell about as long as fourth 3
   Anal cell open; third posterior cell shorter than fourth 4
3. Wings brownish . . . . . **gagatinus** Loew
   Wings tinged slightly with brownish, the base and apex subhyaline, metallic grayish brown body color . . . . . **diligens** O. S.
4. The sixth vein prolonged to wing margin . . . . . **sulphuripes** Loew
   The sixth vein interrupted long before the wing margin . . . . . **paucus** O. S.

Opsebius formosus Loew (Provence), *O. pepo* Loew (Spain) and *O. inflatus* Loew (Europe) have the body black and yellow, and not uniformly blackish as in the American species.

Opsebius gagatinus

Opsebius gagatinus Loew, Centuries, vi, p. 24.

"Blackish, shining, legs and halteres reddish yellow, wings fuscous-black, first posterior cell divided by a cross-vein. Length, $2\frac{3}{4}$ lines. Wing, $3\,{}^{1}/_{12}$ lines.

"Blackish, shining, head and thorax with rather long subfuscous hair, hair of abdomen shorter and paler. Coxae black, legs all yellowish red. Tegulae medium, dirty yellow red, pale pilose, the margins fuscous. Halteres pale lutescent. Wings entirely fuscous black, veins black and disposed as in *O. inflatus*, however anterior cross-vein is oblique, and the other adjacent cross-vein, which divides the first posterior cell, is between the end of the discal and the base of the second submarginal cell."

The type was from Philadelphia, Pennsylvania (Osten Sacken). I have not seen this species.

Opsebius sulphuripes (Pl. VII, fig. 24.)

Opsebius sulphuripes Loew, Centuries, ix, p. 204.

"Blackish, shining, halteres and legs whitish or pale yellowish, wings blackish fuscous, first posterior cell divided by a cross-vein, anal cell open. Length, $2\frac{1}{2}$ lines. Wing, $2\ ^{7}/_{12}$ lines.

"Black, shining. Eyes closely black pilose, however pile on lower part of eyes paler than on upper part. Antennae yellowish. Prothoracic stigmata bordered brown. Dorsum of thorax, scutellum and abdomen whitish pilose. Legs whitish or pale yellowish, finely white pilose Tegulae moderate, hyaline. Halteres pale yellow. Wings brownish, the tips and posterior margins paler; veins brownish black; small cross-vein perpendicular; first posterior cell cut by the other cross-vein, as in *O. gagatinus*, between end of discal cell and base of second submarginal; the third posterior cell, which in *O. gagatinus* goes beyond the base of the fourth, in this species does not reach it, thus the third posterior cell is shorter than the fourth; anal cell, in *gagatinus* and *inflatus* long and closed in the margin, is open in *sulphuripes*."

Habitat—Sharon Springs, New York (Osten Sacken).

Prof. A. L. Melander in his notes on the Acroceridae (1902) mentions a specimen of this species taken at Alameda County, California, which answered the type description well. The species is rare and I have seen only two specimens.

Opsebius pterodontinus (Pl. VIII, fig. 26.)

Opsebius pterodontinus O. S., Berlin Ent. Zeit., xvii, p. 299, (1883).
Opsebius agalenae Melander, Ent. News, xiii, p. 180, (1902).

"Male. Brownish black, shining, clothed with dense, erect, fulvous hairs; legs yellow; wings hyaline; costa with a conspicuous abrupt projection at the end of the first vein. Length, 7 mm.

"The dense hair on the eyes is brownish-fulvous; the antennae brown, arista brownish-yellow; thorax and abdomen are clothed with a uniform covering of erect fulvous hairs, through which the shining, apparently dark brown, ground color is visible. Halteres whitish yellow; tegulae transparent, with a yellowish tinge; veins yellow, anal cell open; third posterior cell much shorter than the fourth, all the veins reach the margin; first posterior cell divided by a cross-vein which is a little beyond the discal cell; posterior cross-vein nearly opposite (a trifle beyond) the origin of the second vein; tip of the second vein opposite the proximal end of the second submarginal cell, the costa, soon beyond the ending of the auxiliary vein is thickened, and the thickening forms an abrupt projection, blunt at the tip; the terminal portion of the first vein, likewise conspicuously thickened, runs parallel to the costa, with a very small space between, and coalesces with it under the projection.

"Hab. Dallas, Texas (J. Boll); a single male labelled 26, IX, which probably means September 26.

"N. B. Wings resemble *Pterodontia*, on account of the expansion of the costa. It may be this character is sexual. The profile of the body of *Opsebius* (*Pithogaster*) *inflatus* figured by Loew, is exactly like this form."

Professor Melander described this species from two males from Austin, Texas, and one male from Rochester, Wisconsin. "One of the Texas specimens was found under a stone, entangled in a web of the Southwestern variety of *Agelena naevia* Bosc., apparently just after issuing from the body of the spider. The shriveled spider was lying close by, with a round perforation near the base of the under side of the abdomen."

Opsebius diligens (Pl. VII, fig. 23.)

Opsebius diligens O. S., Western Diptera, p. 278, (1876).

"Of a slightly metallescent brownish-black color, clothed with brownish-yellow pile; legs brownish-yellow; wings tinged with brownish, the tips hyaline; first posterior cell divided in two by a cross-vein; the bases of the third and fourth posterior cells nearly on the same line; anal cell closed and petiolate. Length about 5 mm.

"The venation is like that of the European *O. inflatus* Lw.,[11] with the following differences: 1. The first posterior cell is divided in two (nearly equal) parts by a cross-vein placed between the end of the discal and proximal end of the second submarginal cell (the same character distinguishes the two North American species described by Mr. Loew in the Centuries); 2. The third and fourth posterior cells have their proximal ends nearly on the same line; in other words the insertion of the intercalary vein is coincident with the cross-vein at the base of the fourth posterior cell; 3. The fifth vein runs straight to the margin, and the sixth is incurved toward it at a short distance from the margin. The costa is distinctly thickened beyond the ends of the first and third veins, and a little beyond the latter. The wing is distinctly tinged with brownish, except at the base and the tip, which are subhyaline.

"Body of a uniform brownish black, slightly metallescent on the thorax. Thorax densely clothed with brownish-yellow erect pile, not dense enough, however, to conceal the shining surface under it. On the abdomen, the same pile is more dense on the second segment; the pile on the two intermediate segments is more blackish, except along the posterior margins, where it is yellowish; the fifth has a shorter and more appressed whitish-yellow pubescence, interspersed with longer pile; the last segment is black, shining, rugose. Legs brownish-yellow; femora slightly tinged with brownish; coxae, except the extreme tip, brown. Halteres with a yellowish-white knob; tegulae semitransparent, colorless. Eyes pubescent; antennae (broken)."

Habitat.—Vancouver Island (G. R. Crotch). Two specimens.

[11] Wiener Entom. Monatschr., 1857, p. 33, tab. i, f. 1.

I have seen numerous specimens of this form from California, and was able to get a number of notes on it, which are included in another part of this paper. There is a good series at Pomona College, Claremont, California.

Opsebius diligens var. **hyalinus** new variety

♀. Very near *diligens* O. S. in appearance. Antennae brown. Eyes short black pilose. Pile of mesonotum and scutellum brownish-yellow. Gray pile on front and sides of thorax and on pleura.

Abdomen black, finely punctate. Dorsum of second and third segments with yellowish brown pile. Incisures, except first, reddish brown. Some black pile on base of segments two, three, four and five. Gray pile on segments four to six.

Legs a dull straw yellow. Wings hyaline with brown veins. Venation and shape of wings as in *diligens*. Length, 2.5 mm. Wing, 3.20 mm.

Habitat.—San Diego County, California. One specimen collected by E. P. Van Duzee (X, 4, 1913).

One other specimen collected at Berkeley, California, May 8, 1915, by Mr. M. C. Van Duzee, is intermediate between *paucus* and *diligens*, and might well be placed with *hyalinus*. The wings are hyaline and the venation the same. The pile of the body is almost entirely brownish yellow. Length, 5 mm.

Opsebius gagatinus Loew, *O. diligens* O. S. and *O. paucus* O. S. are very closely related. I have seen typical forms of the last two, and also specimens which are hard to place. Two specimens loaned for study by Cornell University would, on account of the closed anal cell, be placed under *gagatinus*, an eastern species. These specimens were collected by Professor Bradley in the Giant Forest, Marble Fork, King's River Trail, 6,500 feet elevation, California, on July 24, 1907. I have seen individuals from near this locality which would be placed in *paucus* O. S. on account of the open anal cell, but which were hardly distinguishable from the two specimens above mentioned in other ways. It is possible that the open or closed anal cell may not be a character of specific importance in this little group. In one wing of the smaller specimen from the Giant Forest there are two supernumerary cross-veins and two extra cells (see fig. 25a).

Opsebius paucus (Pl. VIII, fig. 25.)

Opsebius paucus O. S., Western Diptera, p. 279.

"Very like *O. diligens*, but smaller, 4–5 mm. long; sixth vein interrupted before the nearest cross-vein, and thus the anal cell open; the branches of the

fourth vein do not quite reach the margin. Antennae yellowish-brown at the base; pubescence of the eyes long and dense. Thorax with very dense, soft, erect, grayish-yellow pile; the greenish-black, shining ground color but little visible under it. Abdomen brownish-black, moderately shining, densely clothed with brownish-yellow erect pile; the penultimate segment and the hind margin of the preceding one are clothed with recumbent yellowish-white pile. Wings slightly tinged brownish, much less than in *O. diligens*, but more uniformly, as the paler color of the tip is not apparent. The rest as *O. diligens*."

Habitat.—California (G. R. Crotch). One specimen.

ACROCERA

Acrocera Meigen, Illiger's Mag. f. Ins., ii, p. 266, (1803).
Paracrocera Mik, Wien. Ent. Zeit., v, p. 276, (1886).

Antennae placed at extreme top of head, ending in a long thin arista. Venation very much reduced. Proboscis absent or aborted.

Head of male larger than that of female, almost all eyes except for a rather broad vertical triangle, the tiny mouth-part, and the inflated back of the head; head broad ovate when seen from above, but circular when seen from in front; mouth-parts very small and almost at the bottom of the head; proboscis short and withdrawn; back of head rather inflated but close to the thorax and consequently the neck is barely visible; ocelli three. Eyes bare, touching beneath the antennae quite down to the tiny mouth-part. Antennae inserted in the front part of the vertical triangle, apparently two jointed because the basal joint is concealed; next joint apparently orbicular and last joint ovate with a long thin apical arista.

Thorax strongly arched, with none of the calli very prominent (unless from color) though the post alar calli are often quite conspicuous. Pubescence abundant, but usually short and not concealing the ground color, recumbent and coarse. Outer part of male genitalia dilated and prominent. Female genitalia projecting and of characteristic form.

Legs rather short and stout and without spurs or projections. The tarsi are as in *Ogcodes* but the claws are even longer, and the pulvilli shorter and more pad-like. The abdomen is large and balloon-like, conico-globular, with five visible segments; the pubescence is very short and adpressed.

Wings shorter and smaller in male than in female; venation reduced and some of the veins hard to homologize. There is a

simple auxiliary near the costa, a long first longitudinal from which the praefurca issues before the middle of the wing. The second longitudinal, when present arises near the praefurca, but it is indicated by a rudiment in some and in others is obliterated. The open fork in the tip of the wing is composed in the upper part of the end of the third vein, and in the lower by an end piece of the fourth vein; below this are two simple long veins (lower branch of fourth and fifth), and these veins are connected by a long apparent cross-vein between the third and fourth vein and another between the fourth and fifth vein. The anal vein is simple and straight. There is no trace of the discal cell; the posterior veins hardly reach the wing margin. If the cell which includes the wing tip is included, there are three posterior cells in all. Alulae large. Squamae very large, bare, and of apparently thinner texture than in *Ogcodes*. Alar squamae small. (The above is essentially the description given by Verrall in his British Diptera.)

The wing venation is variable and very puzzling in some cases, and it requires a great deal more material to settle certain points. Westwood's short Latin descriptions are far from adequate, now that so many species have been described. So far as known the species of this genus parasitize ground spiders such as *Lycosa* and *Amaurobius*.

Synopsis of Species

1. Dorsum of thorax marked with yellow 2
   Dorsum of thorax without yellow markings 3
2. Thorax with a median black stripe and two elongate spots on either side.
   liturata Williston
   The lateral stripes of dorsum much larger, reaching the black scutellum.
   subfasciata Westwood
3. Second vein present and other veins as in typical form 4
   Venation not typical 7
4. Abdomen largely yellow or reddish 5
   Abdomen mostly black 6
5. Base of abdomen black, the four corners of thorax whitish.
   bakeri Coquillett
   Base of abdomen yellow, the four corners of thorax black.
   bakeri var. **arizonensis** new variety
6. Praescutellar callosities mostly black and the rims of squamae black in females ..... **bulla** Westwood
   Praescutellar callosities mostly white, rims of squamae whitish.
   bulla var. **melanderi** new variety

7. Second longitudinal vein obliterated.....8
Second longitudinal vein represented by a very distinct apical rudiment. **bimaculata** Loew
8. Anterior cross-vein and end of third vein obsolete or entirely wanting.....9
Anterior cross-vein and end of third vein present.....10
9. Abdomen black, wings fuscous at base.....**fumipennis** Westwood
Abdomen more or less yellow; wings hyaline...**unguiculata** Westwood
10. Abdomen with basal black fasciae on each segment, regular in outline. **fasciata** Wiedemann
Abdomen without regular basal fasciae on segments.....11
11. Veins, except first, with an obsolete appearance...**obsoleta** Van der Wulp
Veins black, or at least distinct.....12
12. Legs pale yellow, the abdomen with basal black spots on second, third and fourth segments.....**convexus** new species
First and second segments black.....13
13. Praescutellar callosities blackish, genitalia blackish, wings infuscated. Eastern species.....**nigrina** Westwood
Praescutellar callosities whitish, genitalia marked with yellow; wings almost hyaline. Western species.....**hubbardi** new species

Acrocera bimaculata (Pl. XI, fig. 32.)

Acrocera bimaculata Loew, Centuries, vi, p. 23.

(Transl.) "Male and female. Pitch black, apex of abdomen with two yellow spots, halteres reddish yellow. Wings evenly and slightly infuscated, veins dark fuscous, second longitudinal, except on apical rudiment, entirely lacking. Length ♂ $2\frac{1}{6}$—♀ $2\frac{7}{8}$ lines. Wings ♂ $2\frac{1}{2}$—♀ $3\frac{1}{2}$ lines.

"Pitch black, covered with short subfuscous hair. Humeral callosities mostly testaceous or fusco-testaceous, ante-scutellars sometimes margined testaceous, frequently all one color. Abdomen swollen, near the apex and on both sides with large transverse yellowish spots. Venter blackish, the separate segments bordered whitish posteriorly. Legs pale testaceous, femora and tibiae a large part yellow. Tegulae sordid whitish, margined fuscous. Halteres pale golden yellow. Wings slightly and evenly infuscated, veins apparent, dark fuscous, auxiliary, however, black; third longitudinal vein furcate and cross-veins both complete, as in most of the other species. (D.C. Coll. O.S.)."

Easily recognized by the rudimentary second vein. The abdominal markings are variable. From several specimens Mr. C. W. Johnson gives the length as four to six millimeters. One specimen from Delaware Co., Pennsylvania (C. A. Voelker), had two additional small spots on the posterior margin of the third segment. A small male from Southbridge, Massachusetts (S. W. Bromley), had a margin of yellow on the posterior angles of the fourth segment only. The wings are light hyaline.

Acrocera bakeri (Pl. XII, fig. 34.)

Acrocera bakeri Coquillett, Invertebrata Pacifica i, p. 23, (1904). Published by C. F. Baker.

"Black, the four angles of the thorax, legs and halteres whitish, the prothoracic spiracle and abdomen orange-yellow, the latter having the first segment, a fascia on the second expanding on the sides and extending across the venter, a small basal spot in the middle of dorsum of the third and fourth segments, a large spot on each side of the third segment extending across the venter, in the middle of which it is greatly expanded, a small spot in basal angles of the fourth segment and a pair of spots on the venter of this segment, black; tarsal claws and last tarsal joint except the base, also black; wings hyaline, veins black, calypteres wholly whitish hyaline. Length, 5 mm. A female specimen."

Habitat.—Ormsby County, Nevada. Collected by C. F. Baker.

Type.—No. 6709, U. S. N. M.

Acrocera bakeri var. **arizonensis** new variety (Pl. IX, fig. 28.)

Very near *A. bakeri*. Scutellum and the four corners of the thorax shining black. Basal black triangular spot on second segment; another spot at base of third segment and rounded spot at the base of the fourth. Abdomen orange-yellow. Legs yellow, the coxae black. Venter yellow with black markings under the genitalia. Wings gray hyaline with blackish veins, the venation as in *A. bakeri*.

Habitat.—One specimen, from Chiricahua Mountains, Arizona, June 6. (H. G. Hubbard coll.)

Acrocera fasciata (Pl. XI, fig. 33.)

Acrocera fasciata Wiedemann, Auss. Zweif., ii, p. 16, (1830).

"Head black. Corners of thorax and scutellum yellow. First black abdominal band close to scutellum, goes clear across venter and unites on both sides with the second. The third somewhat smaller with a widening on each side. On either side of abdominal tip is a black spot. Costa of wing black; squamae brownish. Legs pale yellow, last tarsal joint black. Length, $1\frac{1}{2}$ lines.

"Type.—Berlin Museum."

This is probably the best known American species and has been bred from *Lycosa ocreata* Hentz (*L. stonei* Montgomery) and from *Amaurobius sylvestris* at Waltham. A small male specimen from Farmingham, Massachusetts, has the scutellum black except apex, and the wings are a clear, not a brownish hyaline. The uninterrupted bands on all of the segments readily distinguish the species. A female measured five millimeters and had the scutellum entirely yellow. Mr. C. W. Johnson in his paper on

Acrocera (60) figures a wing of *fasciata* which has an adventitious cross-vein between the forks of the third vein.

Acrocera obsoleta (Pl. XII, fig. 36.)

Acrocera obsoleta Van der Wulp, Tijdschr. v. Ent., 2nd Ser., x, p. 139, pl. 3, fig. 17.

The original description is fairly comprehensive. Van der Wulp in figuring the wing indicates all but the auxiliary and first longitudinal veins by dotted lines; "wing veins, except the two first longitudinals, obsolete, fork in the apex of the wing with a short petiole."

I give in the following the original description in the language in which it was written, as it may not be available to all who might wish to refer to it:

"Kop zwart; acchter de oogen een zoom van lichtgrijze bestuiving; de zeer kleine sprieten zwartbruin. Thorax en schildje zwart, met flaauwen glans en zijdeachtige lichtbruine beharing; van de schouders naar den vleugelwortel eene fijne beenwitte lijn, die aan haar voorste einde verbreed is; de knubbels ter wederzijde voor het schildje bruinachtig. Achterlijf bleekgeel, aan den wortel en den anus zwart; de zwarte kleur niet scherp begrensd; die van den wortel zich in't midden enaan die beide zijden uitbreidende, zoodat de gele kleur aldaar dubbel uitbogen is; de middenste ringen hebben eene aanduiding van zwarte driehoekige rugvlekken; buik bleekgeel, met onduidelijke zwarte dwarsbanden, die aan de laaste ringen breeder worden en in't midden zijn ingekeept. Pooten eenkleurig witachtig; alleen de haken der tarsen zwart. Vleugelschubben en vleugels bijna glasachtig, met zeer flaauwe geelbruine tint; de aderen lichtbruin; alleen de voorrandsader, de beide eerste langsaderen en de wortel der derde langsad er duidelijk, de overigen onschijnbaar; het gevorkte uiteinde de derde langsader, benevens de dwarsader, die de der derde en vierde langsadern verbindt, naauwelijks zigtbaar als men den vleugel in eene schuino rigting beziet; de vorkeel is ongeveer half zoo lang als haar steel.

"Aanmerking. Deze soort is zeer verwant aan de ook bij ons voorkomende *A. orbiculus* Fabr.; bij laatsgenoemde zijn ook de onderste vleugelsaderen weinig gekleurd, maar toch, tegen het licht gezien, duidelijk; de vorkeel is bij haar grooter en komt in lengte met den steel overeen."

A specimen sent from the Museum of Comparative Zoology apparently belongs here. It was collected in Orono, Maine, August 5, 1915, by A. P. Morse. The humeri and postalar callosities are white; thorax and pleura black; abdomen bright yellow except narrow basal margin, a dorsal triangle at base of third segment and a small anal spot of black; venter yellow, segments with narrow whitish posterior margins and lateral spots of black.

A male and female of this species were in a small collection loaned by Professor Doane from the Stanford University collection. Both are from Lake Tahoe, California. The venter in the female is almost all black with narrow pale margins to the segments. In the male the ventral segments are black basally and broadly black on the lateral margins. The legs are honey yellow; claws and most of last tarsal joint black. Wings whitish hyaline with pale veins which have an obsolete appearance. There is no second longitudinal vein. Length, 5 mm.

A male from Pullman, Washington (A. L. Melander), was collected July 5, 1907. The scutellum is jet black. The abdominal markings are as in the Lake Tahoe specimen. A female specimen from Denver, Colorado, July 12, 1903 (Van Duzee), has the dorsal black triangles on the abdomen joined to the lateral spots, so that there are complete cross-bands.

Acrocera convexa new species (Pl. X, fig. 29.)

♂. Nearly answers the description of *A. obsoleta* v. d. W. Head and thorax black; the pleura black. Scutellum, mostly yellow, black at base and sides. Humeral callosities yellowish. Abdomen very large and orange-yellow in color. Base of second abdominal segment with black triangle, a shorter triangle on third, and an irregular black spot at base of fourth. Fifth segment and genitalia all yellow. Wings very short, the veins pale, but the anterior cross-vein and upper branch of third clearly present. No second longitudinal. Praescutellar callosities white except blackish base. Venter yellow, the sides black, the black narrowing toward apex of abdomen. Legs yellow, last half of last tarsal joint black. Body with short whitish hair. Length, 5.5 mm.

Female. Markings much as in the male. The abdomen in this specimen much retracted. Abdomen orange color; first segment and base of second black. A large black basal triangle on third segment. Venter black with few markings. Wings much longer than in male; the venation the same.

Type.—Holotype, a male, in U. S. N. M., no. 21206. Siskiyou County, California, (Coquillett).

Allotype in Museum of Comp. Zoology at Cambridge. Spokane, Washington, July 22, 1882, (Henshaw).

Acrocera unguiculata (Pl. XIII, fig. 37.)

Acrocera unguiculata Westwood, Trans. Ent. Soc. London, v, p. 98, (1848.)

Head and thorax black. Abdominal spots rather irregular. Postalar and humeral callosities black. The second segment black with a small yellow spot near the posterior margin. Large irregular spot on margin of third segment not reaching the lateral margins.

Posterior half of fourth segment yellow. Halteres yellow. Squamae whitish hyaline. Legs pale yellowish. Base of venter pale brown. Female genitalia very prominent. Claws large and black. Wings hyaline, the venation incomplete; second vein wanting. Anterior cross-vein (really a portion of the fourth longitudinal) obsolete and also the end of the third longitudinal vein.

I have seen two female specimens from Enola, Pennsylvania (W. R. Walton, VI, 13, 1909), and a specimen from Ft. Washington, Maryland (C. W. Johnson), in which the third segment has a large yellow transverse spot on the posterior half, not reaching the lateral margin. The fourth segment is yellow except a narrow anterior margin. The wings are whitish hyaline. A specimen five millimeters in length, from Lehigh Gap, Pennsylvania (H. L. Viereck), in which the yellow on the abdomen covers all the fourth, all but narrow anterior margin on third, and the posterior dorsal fourth of the second segment, has brownish hyaline wings. A female specimen from Austin, Texas (Col. A. L. Melander), has the yellow of the abdomen confined to a large spot on each side of the second, third and part of fourth segment. This specimen, which appears to be immature, is about 2.5 mm. in length.

Acrocera bulla (Pl. IX, fig. 27.)

Acrocera bulla Westwood, Trans. Ent. Soc. London, v., p. 98, (1848).

♂. Thorax black, with short grayish white hair as on the abdomen. Short gray hair on the occiput. Scutellum black; praescutellar callosities whitish yellow, the humeral callosities yellow. Markings of abdomen somewhat varied. Pleura black; venter blackish-brown; the segments with yellow borders. Male genitalia rounded and quite prominent. Legs whitish-yellow. Venation typical. Length, 3.5 to 4.5 mm. Type described from Georgia.

Specimens from Franconia, New Hampshire (Coll. Mrs. Slosson); Williams, Arizona, June 7 (H. Barber coll.); Medicine Hat, Alberta, Canada, October, 1911 (J. R. Malloch coll.); Stanford University, California (H. Morrison coll.). Two small specimens from Los Angeles, California (Coquillett coll.), may be a variety. They are not much over two millimeters in length, and the abdomen is almost wholly yellow.

I have taken it for granted that Westwood's species has typical venation. One from Bailey's Island, Maine, August 20, 1915 (Dr. G. M. Allen), has very light yellow markings, those on the second segment consisting of two widely separated triangular spots on the posterior margin; the third segment similarly

marked, except that spots are quadrate and very narrowly separated at posterior margin. Fourth segment largely yellow, with dorsal triangle and small triangles at anterior angles, black; venter black; with narrow white posterior margins on all segments. Legs a very light yellow, last tarsal joint and claws black, halteres yellow. Length, 4.5 mm. This specimen is a female.

Specimen collected by S. W. Bromley, at Southbridge, Massachusetts, has dark yellow markings, the two widely separated spots on second segment are quadrate, those on third triangular and narrowly connected, and those on the fourth quadrate and also narrowly connected at posterior margin. The wings and squamae are slightly darker hyaline than the Maine specimen. The abdomen is contracted. The rims of the squamae are black; venation typical. Humeral callosities yellow, the prescutellar callosities mostly blackish. Legs pale brown. Veins of wing distinct and black. This specimen is a female. Length, 5.5 mm. A very similar specimen is from Colebrook, Connecticut, August 14, 1910 (A. L. Melander coll.).

The above mentioned specimens from Franconia, New Hampshire, Williams, Arizona, and Medicine Hat are all males and are much alike. It may be that they do not belong with the females described under this species. The abdomen is yellow and the black abdominal markings small (see fig. 27a). The squamae are whitish with whitish rims. The praescutellar callosities are darkened in the specimens from Arizona. The legs are whitish yellow, the terminal half of last tarsal joint black.

Acrocera bulla var. **melanderi** new variety

♀. Head black. Thorax and scutellum black, shining. Pleura black. Thorax, pleura and scutellum with rather short grayish pile. Four corners of thorax (callosities) whitish.

Abdomen black, shining, a narrow yellow rim at extreme base. Markings much resemble *bulla*. Second segment with two roughly triangular orange yellow spots. Third segment with two similar spots, but they are larger and connected by the narrow yellow posterior border of the segment. End of fourth segment yellow. Genitalia black above at base. Fifth segment with a narrow yellow posterior border. Venter black.

Legs yellowish, brownish on femora and tips of tibiae. Most of last tarsal joint black. Venation as in *bulla*. Veins brown. Last section of costa black. Auxiliary vein black. Abdomen is distorted and wings slightly mutilated. Length, 5 mm.

Habitat.—Gallatin County, Montana. Elevation, 6,400 feet. July 7, 1900. (E. Koch coll.)

Type.—In collection of A. L. Melander.

Since writing the above I have received a specimen taken at Corvallis, Oregon, August 18, 1918, (F. H. Lathrop).

Acrocera liturata (Pl. X, fig. 30.)

Acrocera liturata Williston, Trans. Amer. Ent. Soc., xiii, p. 294, (1886).

"Male. Yellow; three broad, dorsal, thoracic stripes, pectus and tip of the tarsi black; abdomen with irregular brown fasciae. Length, 3 mm.

"Vertical triangle and occiput black, the latter pollinose. Dorsum of thorax honey-yellow, the humeral and post-alar callosities yellowish-white, in the middle with a broad black stripe, attenuated behind, and on each side a large elongate spot or stripe. Pleura dark; pectus black. Scutellum black above, the margin broadly honey-yellow. Tegulae white. Abdomen yellow, translucent, the second and third segments on sides brown, connected by a basal fascia, narrower on the third, dilated triangularly in the middle; fourth segment with a median, basal subtriangular or "T"-shaped spot. Venter brown in middle. Legs yellowish white, the tip of all the tarsi and claws black. Wings hyaline, veins yellowish."

Habitat.—Washington.

I have a female of this species from Stanford University, California (H. Morrisson coll., Oct., 1914). The thorax has a rather narrow median black stripe. The pleura are brown, not very dark. The venation, of which Williston does not speak, is typical. The specimen is shrivelled so that the markings on the abdomen are difficult to make out. There is only a narrow black base to the scutellum. The fourth and fifth segments of the venter each have a round black spot on each side, a larger spot on the third. Length, 3 mm.

Another female of *liturata* was recently sent in to the National Museum from Cedar Pass, South Dakota (C. H. Over coll.). In this specimen the scutellum is jet black. The yellow of the thorax is much darker and the median stripe of the thorax much broader. The antennae are broken off. The two oval spots on the thorax are large and merge with the median stripe before the scutellum. The markings of the abdomen are different from those in the California specimen. There is a basal subtriangular or "T"-shaped black spot on the first abdominal segment; the narrow base and sides of the second segment are black, and there is a median wedge-shaped mark. The third segment has a broad

triangular black mark. Pleura black. Venter black, with brown blotches. Last segment of venter very short. Length, 4 mm.

A specimen received from J. M. Aldrich was collected at Friday Harbor, Washington, July 23, 1905. The median stripe on the thorax does not reach the scutellum and the elongated oval spot on each side barely reaches the praescutellar callosities; upper pleura brown and yellowish. Basal brown triangles on second, third and fourth abdominal segments. There are no markings on lateral margins of abdomen. The halteres are yellow. Venter yellow, brownish toward tip, two round black spots on second segment of ovipositor.

This species resembles *A. trigramma* Loew in general appearance, if one can depend on Loew's figure (79). *A. trigramma* was described from Sicily.

Acrocera nigrina (Pl. XII, fig. 35.)

Acrocera nigrina Westwood, Trans. Ent. Soc. London, v, p. 98, (1848).

Head and thorax black. Thorax with short grayish-white appressed hair. Humeral callosities bright yellow, pleura black. Post-alar callosities blackish-brown, with yellow at each end; scutellum black. First two segments of abdomen all black. Two large yellow spots on third segment, fourth segment largely light yellow with black median basal triangle. Median black spot on fifth segment; the genitalia blackish-brown. Venter blackish-brown, with narrow yellow posterior margins to segments; the last three segments more broadly yellow. Squamae hyaline; the halteres bright yellow. Legs yellow with a pale brownish tinge, the middle section of the femora and tibiae darker. Claws and most of last tarsal joint, black. Second vein usually entirely lacking; there may be a basal, rudimentary stump. Wing dark brown. Wings with a pale brown tint. Length, 5 to 5.5 mm.

Habitat.—The type is in the British Museum, and was described from Georgia.

Mr. C. W. Johnson noted, in his paper on the genus *Acrocera*, that a specimen from Quebec (Provancher) had a stump of the second vein, the basal end, in each wing, and also a short median section of this vein in one wing (see fig. 35) and two sections in the other wing. This specimen was included in material loaned by the Museum of Comparative Zoology. Johnson advances the theory that *bulla*, *bimaculata* and *nigrina* may be varieties of one species, which is not at all impossible.

Localities.—Darien, Connecticut, June 2 (C. W. Johnson); Bennington, Vermont, June 18, 1915 (C. W. Johnson); Shirley Hill, New Hampshire, June 17, 1911 (F. W. Grigg). I have a specimen from Massachusetts, June 18, 1886 (J. G. Jack); color paler, immature.

Acrocera fumipennis

Acrocera fumipennis Westwood, Trans. Ent. Soc. of London, v: 98, (1848).

"Black, shining, wings hyaline, toward base infuscated, veins obscure near base, at apex almost obliterated. Alulae fuscous, legs whitish. Length of body 1½ lines. Expanse of wings 4 lines. Georgia.—Type in British Museum."

C. W. Johnson in his paper on the genus *Acrocera* states that *fumipennis* may be a dark form of *unguiculata* Westwood. "The entire absence of yellow markings in the description, and the statement that the base of wing is smoky brown cannot apply to those seen with obsolete venation."

Acrocera subfasciata (Pl. XIII, fig. 38.)

Acrocera subfasciata Westwood, Trans. Ent. Soc. of London, v: 98, (1848).

"Black, thorax with two cuneiform fulvous spots; abdomen fuscous, first segment with two transverse spots toward apex, two apical fascia on both sides short, luteous; the other segments yellow margined posteriorly. Length, 1½ lines. Expanse, 4½ lines.

"New York.—Type in British Museum.

"Head and thorax black, two cuneiform spots fulvous, spiracles white, sides of mesothorax white posteriorly. Legs white, ungues black. Wings hyaline, veins pale fuscous, costa slightly darker."

C. W. Johnson describes a specimen collected by J. C. Bridwell at Pelham, New Hampshire, September 8, 1905, which agrees with Westwood's description, except that the yellow cuneiform markings on each side of the anterior part of the thorax extend in two very narrow subdorsal lines to the base of the scutellum; likely a variety, apparently resembling *liturata*, which may prove a variety. Abdomen yellow with dorsal and lateral spots of black, those on second segment narrowly connected with those on sides. Venation typical. Williston does not mention the venation of *liturata*.

Acrocera hubbardi new species (Pl. X, fig. 31.)

♀. Head and thorax black, shining. Very fine, short gray hair; praescutellar callosities whitish; the humeral callosities whitish-yellow. Whitish hair on occiput. Most of scutellum black, the outer rim yellowish brown. Abdomen

black with yellow markings, which differ some in the two specimens I have. First and second segments black. Posterior margin of third abdominal segment broadly yellow in middle, the yellow reaching almost to lateral margins. Posterior half of fourth segment orange-yellow. Genitalia black, marked with yellow. Pleura shining black. Venter blackish brown, the segments with yellow posterior borders. Short whitish hair on abdomen. Squamae whitish hyaline. Legs yellowish, femora and tibiae brown except the tips. Tarsi a brownish-yellow, most of last joint black. Claws black. Wings brownish hyaline with brown veins. Second longitudinal vein missing. Very near *A. nigrina* Westwood. Length, 3 to 4.5 mm.

Habitat.—Two female specimens from Santa Rita Mountains, Arizona, May 24. (Hubbard and Schwarz.)

Type.—In U. S. N. M., no. 21205. Holotype a female.

OGCODES

Ogcodes Latreille, Prec. Car. Gen. Ins., p. 154, (1796).
Oncodes of authors.

Antennae placed on lower part of head near the mouth-parts and ending in a long thin style or arista. Proboscis absent. Head of male larger than that of female, almost all eyes except small vertex (on which are two ocelli) and the small space at the bottom of the head, on which are the antennae and indistinct mouth-parts; frons slightly produced below, visible from side; back of head rather inflated in male, but more so in female and crammed onto the thorax; jowls slightly inflated. Proboscis absent, the place where it should be being closed by a membrane. Eyes enormous, quite bare. Antennae apparently two-jointed, dove-tailed into face; apparent basal joint cylindrical, short and thick; apparent second joint oval, with long apical thin style which is dilated at its base but ends in a minute hair-like bristle.

Thorax forming a complete sphere; humeral, praealar and post-alar calli large, but not very conspicuous; pubescence rather dense and soft but hardly abundant enough to be furry, and without the slightest sign of bristles or long hairs even on the post-alar calli or the margin of the scutellum. Scutellum large, with a very deep rounded margin, which leaves only a small portion of the disc rather flat, pubescence similar to that of thorax; metanotum rather small.

Abdomen dorsally arched but hardly globular, short ovate with a blunt base and tip in the male, but short and round in the

female, with five obvious segments; short pubescence fairly abundant. Genitalia concealed beneath the rather small fifth segment.

Legs rather short and stout, but simple and without any trace of spurs or processes; tarsi with first and fifth joints longer than the others. Pulvilli and claws well separated from fifth tarsal joint; claws long and thin; pulvilli in male almost equally long and thin, but shorter and more pad-like in female.

Wings short in male, but larger and longer in female; venation very imperfect; in *O. costatus* the two large basal cells and the closed anal cell can be traced, but the small cross-vein is absent; the wing-tip is clear of all venation for a considerable space; second longitudinal vein absolutely absent; third vein sloping downwards, incomplete, and not forked; fourth vein indicated by three incomplete veins running toward the margin long after the wing tip. Squamae (thoracal) enormous, depressed, and clothed all over upper surface with not at all dense wooly pubescence; alar pair rather small but thick, clothed only with minute down. Halteres on comparatively short stems, hidden beneath squamae.

Verrall considers that there are six species in the Palaearctic region, although Kertesz gives thirteen in his Catalog. There are thirteen species from North and Central America: one from South Africa, one from Southern Asia, and about six from Australia and New Zealand.

Erichson gave a fairly good characterization of *Ogcodes* in his Monograph of 1840. He preferred *Ogcodes* to *Henops*, claiming that the former name was older and that Meigen had not clearly defined *Henops*. Dr. Benno Wandolleck, in 1909, published a paper on the "Mouth opening of Ogcodes," and gave a detailed account of its structure. He found that dried material was useless in this study, as did Erichson in 1846.

The following artificial table may help to separate the species of this difficult genus. I have not included *engonatus* and *humeralis* in this table, as I have not seen either of the species, and the descriptions offer no striking characters that would establish them. Both are near *costatus* Loew, and the types would have to be examined before drawing any conclusions as to their status.

Synopsis of Species

1. Male orange to brownish yellow with dark brown spots on the abdominal spiracles. Female brown ..... **dispar** Macquart
   Not colored thus 2
2. Brown species averaging 7–9 mm. in length; the wings infuscated. **incultus** O. S.
   Smaller species; wings usually hyaline 3
3. Body shining blackish, with unusually long, erect brownish pile on thorax. **niger** new species
   Pile of body shorter; ground color of body usually brownish 4
4. Abdomen mostly reddish above ..... **rufoabdominalis** new species
   Abdomen mostly brown or blackish 5
5. Humeri usually yellowish 6
   Humeri usually blackish 7
6. Pleura brownish yellow; scutellum blackish brown.
   Small species, known only from Pacific Coast region . . **aedon** Townsend
   Scutellum usually more or less yellow; the white posterior margins of abdominal segments sharply defined ..... **costatus** Loew
7. Legs dull yellowish, the coxae black ..... **borealis** new species
   Legs more or less blackish or brown 8
8. Abdomen largely white above; venter white except a transverse band on the last segment ..... **albiventris** Johnson
   Abdomen not marked in this manner 9
9. Pile of body whitish 10
   Thorax with reclinate yellow pile; rims of squamae blackish. Rather small species ..... **pallidipennis** Loew
10. Rims of squamae black, hind margins of first three abdominal segments narrowly white. Legs blackish ..... **melampus** Loew
    Rims of squamae yellowish. Pile of thorax quite long and erect. Very wide white posterior margins on male abdominal segments. Legs marked with yellow ..... **marginatus** new species

Ogcodes melampus

Oncodes melampus Loew, Centuries, x, p. 236.

"Black, humeri, margin of tegulae, all of legs and veins of wing concolorous, abdominal segments with white posterior borders, ventral segments white, each with basal black band. Length, $2\frac{2}{3}$ lines. Wing, $2\ ^{11}/_{12}$ lines.

"Black, pile whitish, not sublutescent. Humeri of like color with rest of thorax. Abdomen with segments posteriorly white margined, border of first segment narrowest, borders of second and third narrow and equal, that of the following segments a little wider and less even; venter white, first segment black, toward the sides wider and suddenly dilated near the margin of the abdomen. Legs all black. Halteres fuscous black, tegulae whitish, black margined. Wings hyaline, pale ashy tinge, veins all black. ♂ and ♀."

Habitat.—California (H. Edwards).

Osten Sacken in Western Diptera doubtfully refers a specimen to *melampus*. "Tibiae brown, not black; borders of tegulae very pale brownish; the wing veins are very pale, except those near the costa, which are brownish."

There are four specimens labelled *melampus* in the United States National Museum, from Santa Cruz Mountains, California. They are quite varied in size and coloring. None are black and all have brown wing veins. There is a slight brownish tinge to the wings. The legs are brown. Only two specimens have typical abdominal markings. The markings on the venter may vary considerably. One specimen from Rio Piedras Verdes, Sierra Madre, Chihuahua, Mexico, 7,300 feet (coll. Townsend), apparently belongs here. There are several specimens in the National Museum from California which are near *melampus*, but which cannot be determined with certainty.

Ogcodes eugonatus

Oncodes eugonatus Loew, Centuries, x, p. 236.

"Black, pile whitish, not sublutescent vestiture. Humeri of same color as rest of thorax. Abdomen with each segment widely bordered white posteriorly; venter white except black base of first segment, rest of segments with base black, black color, however, suddenly very much dilated toward the abdominal margin. Legs pitchy black; femora toward apex honey-yellow; tibiae above pitchy black, below honey-yellow, apex all yellow; however, apex of first tarsal joint black. Halteres black; tegulae whitish, black margined. Wings pure hyaline, shorter in proportion than in the preceding species, costal and first two longitudinal veins less strong, fuscous black, rest of veins pale."

Habitat.—Texas (Belfrage).

I am inclined to believe this to be a color variety of *costatus*. I have not seen the types of the two species.

Ogcodes incultus

Oncodes incultus O. S., Western Diptera, p. 279.

"Brownish-black; humeral callosities brownish-yellow; antescutellar callosities yellowish-brown; posterior margins of abdominal segments white; legs dark brown; knees brownish-yellow; wings strongly tinged with brown. Length, 8 mm.

"The brownish-black thorax and scutellum are clothed with a dense, short, yellowish pubescence; abdomen dark brown, segments two and three with narrower, four and five with broader, white posterior margins; venter, except the base, white; each segment with a black cross-band on the anterior margin. Tegulae brownish, with narrow dark brown edges. Halteres with a brown knob. Wings comparatively long, strongly and rather uniformly tinged with brown.

This color is darker in the costal cells, especially in the interval between the auxiliary and the first veins; costa distinctly incrassate in the region of the stigma; veins brown.

"Hab.—White Mountains, New Hampshire. Two specimens.

"Easily distinguished from the other described species of the genus by its strongly infuscated wings and its large size. The abdomens of my specimens being somewhat shrunken, the measurement I give is only an approximation."

There are nine specimens of this species in the United States National Museum. The pile of the body is very pale yellow, in some forms whitish. In all the abdomen is somewhat shriveled as in the type material. A specimen from San Diego, Texas, October 26, is 8.5 millimeters in length. A specimen from Camel's Hump, Vermont, has very narrow, white, posterior margins on third, fourth and fifth segments of abdomen and no distinct markings on the venter. The legs are uniformly pale brown. A specimen from Tyngsboro, Massachusetts, has the underside of the femora and tibiae yellow. One typical specimen from Victoria, Texas, April 5, was collected by E. A. Schwarz. We have also a specimen collected at St. John, New Brunswick, July 8, 1902 (W. McIntosh), and one specimen from the type locality (Morrison). I have seen specimens from New York, Maine, Massachusetts and Illinois. The specimen collected by Morrison has yellowish legs, yellowish antennae and brown humeri. The wings are infuscated but pale. A rather small specimen from Rociada, New Mexico (Cockerell), has pale wings and legs. A specimen received from Nathan Banks was collected at Falls Church, Virginia, August 21.

Ogcodes pallidipennis

Oncodes pallidipennis Loew, Centuries, vii, p. 23.

"Blackish brown, clothed with pale lutescent pile, abdominal segments narrowly margined posteriorly with white, wings hyaline, veins whitish. Length, 2 lines. Wings, 2¼ lines ♀.

"Blackish-brown, clothed with pale lutescent pile. Thoracic callosities and praescutellars testaceous. Posterior margins of the abdominal segments narrowly white. Venter fuscous, the segments with narrow whitish posterior margins. Legs fuscous-testaceous, femora except extreme apex brownish black, tarsi except apex fuscous. The tegulae dirty whitish, margined fuscous. Halteres black, the stem pale. Wings hyaline, the veins all faded, no stigmatical spot.

"Hab.—Penn[sylvania]. (O. S.)

"Note. *Oncodes dispar* Macq. with yellowish tegulae, has yellowish halteres and blackish brown stigmatical spot."

This is a hard species to place with certainty and the type would have to be studied to make sure.

I have seen specimens answering this description from several localities, mostly in the New England States; two specimens were taken in Toronto and Manitoba. A specimen in the National Museum, collected by A. A. Girault at Coulterville, Illinois, has a label, "Bred from cell of *Sceliphron cementarius*. Iss. June 18, 1911."

Ogcodes costatus (Pl. XIV, fig. 40.)

Oncodes costatus Loew, Centuries, ix, p. 202.

"Black, posterior margins of abdominal segments whitish, costa and veins of wing fuscous, apical half of costa incrassate. Length, 2½ lines. Wing, 2 5/12 lines.

"Shining, of pitch black color, prothoracic stigmata margined black, tarsi, however, toward apex black, pulvilli and empodia concolorous. Abdominal segments with posterior white fasciae, narrow and evenly marked. First ventral segment black, with posterior white fascia, quite narrow but dilated toward sides. Tegulae dirty whitish, margined fuscous. Wings subhyaline showing toward base a vestige of subfuscous color; costa and veins deep fuscous; apical half of it incrassate, half of posterior cross-vein obsolete."

Habitat.—Massachusetts (Sanborn).

I have seen a number of specimens of this species from various localities and all were males. Perhaps the female is known as another species. The four species: *melampus, eugonatus, pallidipennis* and *costatus* all seem to merge. C. W. Johnson sent a specimen of *costatus,* or what seemed to be that species, which had a black scutellum. It is impossible to place immature specimens of this group. Specimens of what I would term *pallidipennis* are on the average smaller than the other three species mentioned above, but size is a very unreliable character in any parasitic form, especially if there is at most a difference of only two or three millimeters. I have seen no specimen of *costatus* from localities west of Michigan. Malloch gives several localities in Illinois (97), a large series taken on dead twigs of elm. There was considerable color variation in these.

Ogcodes humeralis

Oncodes humeralis O. S., Biologia Centr.-Amer. Dipt. i, p. 164, (1887).

"Humeral and prescutellar callosities and also pleurae brownish-yellow; legs yellowish-brown, tips of tarsi darker; wings subhyaline.

"Hab.—N. Sonora, Mexico.

"Face, vertical triangle, occiput and antennae black; thorax the usual brownish black, metallescent color, with dense, short, yellowish pubescence.

Humeral and praescutellar callosities and upper part of the pleurae brownish-yellow; above the coxae the pleurae are black, shining. Legs yellowish-brown, including the front coxae; extreme base of the latter black; tarsi brownish; ungues and pulvilli black. Tegulae honey-colored, without any perceptible darker margin. Halteres with a brown knob. Abdomen brown, the hind margins of the segments white. Venter whitish-yellow; incisures darker. Wings subhyaline; very slightly tinged with brownish before the apex, near the costa; auxiliary and first veins brownish; the costa, beyond the junction of the auxiliary vein, is dark brown and a little stouter. A single male.

"Among the described North-American species, *O. incultus* O. S., alone has the humeri of a paler color than the thorax; but it is easily distinguished by its large size, its brownish wings, etc."

At least two other species (*costatus* and *aedon*) have the humeri paler than the rest of the thorax. This is a variable character.

Ogcodes aedon

Oncodes aedon Townsend, Proc. Cal. Acad. Sci., ser. 2, no. 4, p. 607, (1895).

"Very similar to *Oncodes humeralis* O. S.,[13] but differs in the tegulae being fuscous whitish with well-defined narrow dark brown margins. Wings without apical brownish tinge.

"Humeral and prescutellar callosities, and upper pleurae brownish-yellow. Thorax and scutellum, and lower pleurae, brownish-black. Legs yellowish-brown, tarsi darker. Head black, thorax with short yellowish pubescence. Tegulae obscure whitish, or with a fuscous tinge, possessing a well-defined dark brown border. Knob of halteres brown. Abdomen brownish, hind borders of segments yellowish-white. Wings subhyaline, costal margin brown distally and more yellowish basally.

"This species differs from *O. pallidipennis* Lw. in the blackish scutellum, yellowish outer humeral callosities and pleurae, and more distinctly margined tegulae. From *O. melampus* Lw., it differs in the yellowish humeral and prescutellar callosities, yellowish pleurae and much smaller size and lighter coloring.

"Baja Purisima, Lower California, April. One specimen. Length slightly more than 4 mm."

A male specimen in the National Museum may be placed in this species. Thorax black. Border of squamae not well defined.

Ogcodes niger new species (Pl. XV, fig. 41.)

♀. Body shining black, thus differing from all other North American species. Occiput black and almost flat, very little swollen. Head longer than usual and of different shape in this specimen at least; not sloping back. Antennae whitish. Thorax with rather long brownish pubescence which has gray reflections; the body color is plainly visible through it. Scutellum not

[13] Biol. Centr. Amer., Dipt., i, p. 164 to 165.

as long as in some species, with rather long thick brown pile. Humeral and prealar calli black. White color which is around base of wings extends some distance on the post-alar callosities. Squamae grayish with black margins, the black color spreading some distance into the membrane; surface of squamae with short white pile. Alar squamae pure white. Thoracic spiracle white and with a narrow white line separating pleura from mesthoracic dorsum. Pleura and coxae brownish-black.

Abdomen shining brownish-black with sparse white pile; the posterior margins of all abdominal segments but first, narrowly white. Femora darkened, knees, tibiae and tarsi whitish; the claws black. First and second segments of venter and median spot on third blackish-brown, the rest sordid whitish. Wing veins pale brown but quite strong; the upper branch of the fifth longitudinal fork and the anal vein much clearer than usual (see fig. 41).

Habitat.—Stockton, Utah, July 11, 1916, (T. Spaulding).

Type.—A female in Museum of Comparative Zoology at Cambridge.

Ogcodes dispar (Pl. XIV, fig. 39.)

Oncodes dispar Macquart, Dipt. Exot., Suppl., v, p. 67, pl. 11, f. 12, (1855).

♂. Body bright yellow. Head and antennae blackish. Thorax with a brown tinge in some specimens. Scutellum brownish-yellow. Thorax and scutellum with short yellow pile which does not conceal the ground color. Pleura yellowish. Squamae yellow hyaline with a yellow margin.

Abdomen usually a little paler than thorax. Incisures whitish and raised slightly. Sides of abdomen with very conspicuous blackish spots around the spiracles. Venter yellow with broad whitish posterior margins to segments and round brown spots at sides of second, third and fourth. Stem of halteres yellow, the knob brown. Genitalia brown.

Legs yellow with short yellowish pile. Hind tibia darkened in middle and above in some specimens. Tarsi brownish, the last joint darkest. Claws black. Wings hyaline with a slight brownish tinge. Costal cells pale brown. Veins of wing brown. Length, 5.5 mm.; wing, 5 mm.

♀. Body a sepia brown, often with yellowish or whitish mottlings. Head noticeably smaller and wings larger than in the male. Squamae pale brown. Abdomen dark brown with narrow white incisures. Venter blackish brown with paler posterior margins. Legs darker than in male and wings more infuscated. Length, 5.5 mm.; wing, 6 mm.

Habitat.—Macquart described the species from Baltimore, Maryland (coll. M. Bigot). I have seen specimens from Maryland; Arizona; Montreal, Quebec, and Pennsylvania.

Macquart noted the difference in color of two specimens on the same pin. He could not distinguish the sexes but considered them one species. There are a number of specimens in the National Museum from Plummer's Island, Maryland, taken in May,

June and August. One pair was taken in copula, April 25, 1912, by E. A. Schwarz. Mr. E. T. Cresson, Jr., loaned a pair taken in copula, June 18, 1905, at Swarthmore, Pennsylvania.

Ogcodes marginatus new species (Pl. XV, fig. 42.)

♂. Eyes, head and thorax black. Antennae black. Frons black and not prominent, with a few short white hairs. Few white hairs on sides of face.

Thorax, pleura and scutellum black, semi-shining and with fine white pile. The pile is unusually long and dense for an *Ogcodes*, that on the thorax in certain lights almost obscuring the ground color. Humeral and praescutellar callosities black. Squamae white with pale rims; there is a narrow hyaline space between the rim and the white color of center of squamae which is very noticeable.

Abdomen black, the posterior margin of the first segment narrowly white. Posterior margins of other segments wide (see fig 42). Abdomen clothed with erect whitish pile. Venter white, the segments with a brownish black basal stripe, rather narrow except on first two, and suddenly widening near the lateral margins. Genitalia black. Coxae and femora black, apical third of femora yellowish. Tibiae yellowish, basal two-thirds darkened on outer side. Tarsi blackish and rather short, especially first joint. Femora with fine white pile. Wings hyaline. Costa and veins at base of wing brownish, yellow the rest of their length.

Habitat.—Upper Geyser Basin, Yellowstone Park, Wyoming, 7,200 feet elevation, August 24, 1915.

Type.—One male specimen in Cornell University collection. There are two male paratypes in the Kansas University collection, from Clark County, Kansas, June, elevation, 1,962 feet (F. H. Snow).

A specimen from Fort Collins, Colorado, July 10, 1907, in the collection of C. W. Johnson, is very probably a female of this species. It is near *melampus* Loew. The white posterior margins of the abdominal segments are very narrow on the first and second segments, gradually wider on the following segments, and rather irregular.

Three small specimens in the National Museum collection may belong here. These are: one male from Mono Lake, California, June 21, 1911; a male from Los Angeles, California (Coquillett); a female from Salt Lake, Utah, June 26 (H. S. Barber).

Ogcodes albiventris

Oncodes albiventris Johnson, Psyche, xi, p. 18, (1904).

"Head black, antennae yellow. Thorax and scutellum black, shining and covered with erect yellowish pile. Abdomen white, and marked with black as

follows: first segment with a large dorsal spot, the other segments with a short transverse basal band, which extends only over the dorsal third, and from which projects posteriorly, except on the last segment, a short dorsal triangle; third and fourth segments with a small spot on each side of the dorsal line near the posterior margin; all the segments with a small lateral triangle, most prominent on the last three segments; venter white, with a single transverse band on the last segment; the entire abdomen covered with whitish hairs. Legs yellow, coxae and basal half of the femora black, tips of the tarsi brownish. Wings hyaline, veins light yellow, tegulae whitish with a narrow hyaline margin. Length, 5 mm."

One specimen, Toronto, Ontario, Canada, July 18, 1896.

Ogcodes borealis new species

♀. Head black. Thorax and humeral callosities black. Pleura mostly black, yellowish brown just below base of wing. Thoracic pile yellowish white. Scutellum black. Praescutellar callosities black, brown above next to thorax. Squamae infuscated and black rimmed, whitish pile on the surface.

Abdomen blackish brown. Posterior borders of segments narrowly yellowish white, the band on first segment very narrow, wider on succeeding segments. Pile of body very short. Posterior margins of ventral segments yellowish white and the lateral margins of the second, third and fourth segments narrowly whitish. Legs pale brownish yellow, the coxae black. Wings slightly infuscated, the veins brown and distinct.

Type.—Montreal, Quebec. May 28, 1902. In collection of C. W. Johnson.

Another specimen from St. Johns County, Quebec, is in the collection of C. W. Johnson. I have made this a paratype. In this specimen the squamae are more whitish hyaline. The venter is yellowish brown with darker lateral margins. This species can be recognized by the pale yellowish legs.

Ogcodes rufoabdominalis new species (Pl. XV, fig. 43.)

♂. Head black. Antennae blackish brown. Thorax and scutellum black with bright yellow pile, which is quite thick and in some lights a pale golden color. Pleura black. Squamae whitish hyaline, yellowish near the yellow borders, and with short yellow pile. Halteres blackish brown.

Abodmen orange yellow. Segments two to six with a basal blackish band which does not reach nearly to the lateral margins (see fig. 43). The incisures whitish. Pile of abdomen short, erect, and yellow. There is a blackish brown spot on the stigmata along the sides of the abdomen as in the male of *dispar*. Venter orange yellow with narrow whitish posterior margins. Genitalia blackish brown.

Coxae mostly black, but with some yellowish brown coloring. Trochanters jet black. Femora and tibiae brownish yellow. Tarsal joints dark brown

apically, ungues and last joint black. Wings almost hyaline, faintly infuscated, especially along the costal border. Veins blackish brown and very distinct.

Habitat.—Great Salt Lake, Utah, June 8, 1915. Collected by M. C. VanDuzee.

Type.—One male specimen, in collection of M. C. VanDuzee.

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EXPLANATION OF PLATES

All figures were drawn free hand by the author and unless otherwise stated, the drawings were made from the specimens. A binocular microscope was used in this work.

Plate I

Types of wing venation in the Cyrtidae

Fig. 1. Actual length, 15.5 mm. The lettering as in Verrall's figure in British Diptera. a. Costal vein. b. Auxiliary vein. c. First longitudinal vein. d. Second longitudinal vein. e. Third longitudinal vein. e^1 Upper branch of the fork of third vein. e^2 Lower branch of the fork of third vein. f. Fourth longitudinal vein. f^1 Upper branch of fourth vein. f^2 Second branch of fourth vein. f^3 Third branch of fourth vein. g. Fifth longitudinal vein. g^1 Upper branch of the fifth longitudinal fork. g^2 Lower branch of the fifth longitudinal fork. h. Sixth longitudinal or anal vein. i. Auxiliary vein. Praefurca—common stem of second and third veins. Ambient vein—continuation of costa around the posterior wing margin. w. Humeral cross-vein. x. Discal or middle cross-vein. y. Lower cross-vein. Anal cross-vein—g^2 (lower branch of fifth vein). 1. Costal cell. 2. Subcostal cell. 3. Marginal cell. 4. Submarginal cell. 4a. Second submarginal cell. 5. First posterior cell. 6. Discal cell. 6a. Second posterior cell. 6b. Third posterior cell. 7. Fifth posterior cell. 8. Auxiliary cell. 9a. Upper (or first) basal cell. $9a^2$. Second upper (or outer first) basal cell. 9b. Second basal cell. 9c. Anal cell. 10. Alula.

Fig. 2.—Actual length, 7 mm.

Fig. 3.—Actual length, 9 mm.

Fig. 4.—Actual length, 5.5 mm.

Fig. 5.—Actual length, 7 mm. Redrawn from Verrall.

Fig. 6.—Actual length, 8 mm.

Fig. 7.—Actual length, 5 mm.

Fig. 8.—Actual length, 6 mm.

Fig. 9.—Actual length, 4.2 mm.

Plate II

Fig. 10.—*Lasia scribae* O. S.

Fig. 10a.—*Lasia scribae* O. S. Head from front, with proboscis and antennae cut away.

Fig. 11.—*Lasia scribae* O. S. Outline drawing of side view.

Plate III

Fig. 12.—*Ocnaea loewi* new species.
Fig. 12a.—*Ocnaea loewi* new species. Ocelli and base of antennae from above much enlarged.
Fig. 12c.—*Ocnaea loewi* new species. Antenna much enlarged. Third joint from inner side.
Fig. 13.—*Ocnaea schwarzi* new species.
Fig. 13a.—*Oncaea schwarzi* new species. Outline drawing from side.
Fig. 13b.—*Ocnaea schwarzi* new species. Ocelli and base of antennae from above, greatly enlarged.

Plate IV

Fig. 14.—Abdomen of *Ocnaea coerulea* new species.
Fig. 14a.—*Ocnaea coerulea* new species. Outline drawing of head, from side.
Fig. 14b.—*Ocnaea coerulea* new species. Outline drawing of antenna. Greatly enlarged.
Fig. 14c.—Wing of *Ocnaea coerulea* new species.
Fig. 15.—*Ocnaea grossa* O. S. Redrawn from Van der Wulp's figure in the Biologia.
Fig. 16.—*Eulonchus smaragdinus* Gerst.
Fig. 16a.—Blunt type of antenna of *Eulonchus smaragdinus*.
Fig. 16b.—*Eulonchus smaragdinus* Gerst. Sharp pointed type of antenna of same species.
Fig. 16c.—*Eulonchus smaragdinus* Gerst. Outline drawing of head from front.
Fig. 16d.—*Eulonchus smaragdinus* Gerst. Outline drawing of ocellar tubercle. Greatly enlarged.
Fig. 17.—End of wing of *Eulonchus marginatus* O. S.
Fig. 17a.—Antenna of *Eulonchus marginatus*.
Fig. 17b.—*Eulonchus marginatus*. Outline drawing of head from front.

Plate V

Fig. 18.—*Eulonchus tristis* Loew.
Fig. 18a.—*Eulonchus tristis* Loew. Antenna greatly enlarged.
Fig. 18b.—*Eulonchus tristis* Loew. Outline drawing of head from front.
Fig. 19.—*Eulonchus sapphirinus* O. S.
Fig. 19a.—*Eulonchus sapphirinus* O. S. Outline drawing of head from front.
Figs. 19b and 19c.—*Eulonchus sapphirinus* O. S. Types of antennae. Greatly enlarged.
Fig. 19d.—Wing of variety of *Eulonchus sapphirinus*.

Plate VI

Fig. 20.—*Pterodontia analis* Westw.
Fig. 20a.—*Pterodontia anatis* Westw. Antenna, much enlarged.
Fig. 21.—*Pterodontia johnsoni* new species. Wing.
Fig. 21a.—*Pterodontia johnsoni* new species. Two views of antenna.
Fig. 21b.—*Pterodontia johnsoni* new species. Last tarsal segment, with ungues. Much enlarged.
Fig. 22.—*Pterodontia flavipes* Gray.
Fig. 22a.—*Pterodontia flavipes* Gray. Antenna, much enlarged.

Plate VII

Fig. 23.—*Opsebius diligens* O. S.
Fig. 24.—*Opsebius sulphuripes* Loew.

Plate VIII

Fig. 25—*Opsebius paucus* O. S.
Fig. 25a.—Wing of *Opsebius* species near *paucus*.
Fig. 26—*Opsebius pterodontinus* O. S.

Plate IX

Fig. 27.—*Acrocera bulla* Westw., ♂.
Fig. 27a.—*Acrocera bulla* Westw., ♂. Dorsal view of abdomen.
Fig. 27b—*Acrocera bulla* Westw. Female genitalia. Much enlarged.
Fig. 27c.—*Acrocera bulla* Westw. Male genitalia. Much enlarged.
Fig. 27d.—*Acrocera bulla* Westw. Head from above. Much enlarged.
Fig. 28.—*Acrocera bakeri* var. *arizonensis* new variety.

Plate X

Fig. 29.—*Acrocera convexa* new species.
Fig. 29a.—*Acrocera convexa* new species. Abdomen from above.
Fig. 30.—*Acrocera liturata* Williston.
Fig. 31.—*Acrocera hubbardi* new species.

Plate XI

Fig. 32.—*Acrocera bimaculata* Loew.
Fig. 32a.—*Acrocera bimaculata* Loew. Female genitalia. Much enlarged.
Fig. 33.—*Acrocera fasciata* Wiedemann.

Plate XII

Fig. 34.—*Acrocera bakeri* Coquillett. From type.
Fig. 35.—*Acrocera nigrina* Westw.
Fig. 35a.—*Acrocera nigrina* Westw. Dorsal view of abdomen.
Fig. 36.—*Acrocera obsoleta* V. d. W. Abdomen from above.
Fig 36a—*Acrocera obsoleta* V. d. W. Abdomen of female from side.
Fig. 36b—*Acrocera obsoleta* V. d. W. Dorsal view of male abdomen.
Fig. 36c.—*Acrocera obsoleta* V. d. W. Lateral view of male abdomen.

Plate XIII

Fig. 37.—*Acroccra unguiculata* Westw.
Fig. 37a.—*Acroccra unguiculata* Westw. Dorsal view of abdomen (drawn from another specimen).
Fig. 37b.—*Acrocera unguiculata* Westw. Head from above. Much enlarged.
Fig. 38.—*Acroccra subfasciata* Westw.
Fig. 38a.—*Acroccra subfasciata* Westw. Dorsum of thorax.

Plate XIV

Fig. 39.—*Ogcodes dispar* Macquart. Female.
Fig. 39a.—*Ogcodes dispar* Macquart. Male.
Fig. 40.—*Ogcodes costatus* Loew.

Plate XV

Fig. 41.—*Ogcodes niger* new species, ♀.
Fig. 42.—*Ogcodes marginatus* new species. Dorsum of abdomen, ♂.
Fig. 43.—*Ogcodes rufoabdominalis* new species. Dorsum of abdomen, ♂.
Fig. 45.—Male genitalia of *Ogcodes dispar* Macquart. Much enlarged.
Fig. 46.—Male genitalia of *Ogcodes costatus* Loew. Much enlarged: a. from above; b. from side.
Fig. 47.—Male genitalia of *Ogcodes incultus* O. S. Much enlarged.